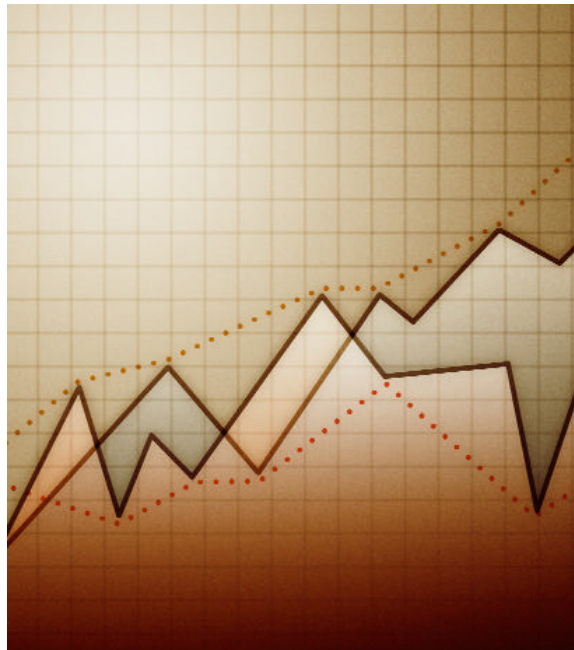


Final Report

# Illinois Recycling Economic Information Study



Prepared for the  
Illinois Department of Commerce  
and Community Affairs

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# RECYCLING ECONOMIC INFORMATION STUDY

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This report has been prepared for the use of the client for the specific purposes identified in the report. The conclusions, observations and recommendations contained herein attributed to R. W. Beck, Inc., ("R. W. Beck") constitute the opinions of R. W. Beck. To the extent that statements, information and opinions provided by the client or others have been used in the preparation of this report, R. W. Beck has relied upon the same to be accurate, and for which no assurances are intended and no representations or warranties are made. R. W. Beck makes no certification and gives no assurances except as explicitly set forth in this report.

### OVERVIEW

This Executive Summary presents the results of the Illinois Recycling Economic Information (REI) Study, which was commissioned by the Illinois Department of Commerce and Community Affairs and conducted by R. W. Beck, Inc. in association with Iowa State University. The main report provides additional detail beyond that found in this Executive Summary and thoroughly documents the methodology used in producing the study results.

The REI Study methodology conforms to the methodology for gathering economic data on the recycling and reuse industry that was developed by the Northeast Recycling Council and that has been used in many other state and national REI studies.<sup>1</sup> Recycling establishments that use a combination of recycled and virgin feedstock in making their products were defined to be recycling and reuse industry establishments for the purposes of this project.<sup>2</sup>

Economic statistics were gathered for each of twenty-six categories of recycling and reuse establishments that were considered to be directly in the recycling and reuse industry. The direct economic values that were measured by this study included:

- Number of establishments;
- Employment;
- Annual payroll;
- Annual receipts; and
- Annual recovered material throughput (for recycling categories).

The study also estimated the broader effect of recycling and reuse industry establishments and personal spending by their employees on the Illinois economy in terms of jobs and economic activity supported in other industries. This information was developed through economic modeling and included an analysis of state tax revenues attributable to the recycling and reuse industry.

Finally, the study projected the economic effects of three industry growth scenarios. The analyses included an estimate of the required investment in recycling associated with each of the scenarios. The three scenarios were:

- Achieving a 35 percent state recycling rate;
- Achieving a 50 percent state recycling rate; and
- Banning the disposal of electronics in Illinois landfills.

### SIZE OF THE RECYCLING AND REUSE INDUSTRY

Illinois' recycling and reuse industry is highly diverse in terms of which recovered materials are utilized, average establishment size, and which technologies are employed. Its recycling sector includes long-established sub-industries, such as paper and steel making, as well as new entrepreneurial ventures, such as composting and recycled rubber product manufacturing. The reuse and remanufacturing sector encompasses a diverse mix of

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<sup>1</sup> Northeast Recycling Council, *Recycling Economic Information Study*, June 2000.

<sup>2</sup> In general, entire-establishment economic data were counted. However, economic data were adjusted to eliminate virgin-only establishment data, remove the economic activity associated with virgin-material preparation at mixed virgin and recycled feedstock establishments, and remove the economic activity of manufacturing steps that are unrelated to recycling (e.g., converting intermediate products to finished goods).

## EXECUTIVE SUMMARY

establishments, including wood reuse (e.g., pallet rebuilders), tire retreaders, and electronic appliance demanufacturers. The size and diversity of Illinois' recycling and reuse industry are illustrated in Table ES-1, which presents estimates for twenty-six categories of establishments.

**TABLE ES-1**  
**ECONOMIC SIZE OF THE ILLINOIS RECYCLING AND REUSE INDUSTRY**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.<sup>3</sup>

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity
<b>Recycling Industry Economic Activity</b>		
1. Government Staffed Collection	Establishments	204
	Employment	900
	Annual Payroll	31,275
	Estimated Receipts	63,491
	Estimated Throughput	274
2. Private Staffed Collection	Establishments	270
	Employment	1,200
	Annual Payroll	41,700
	Estimated Receipts	84,161
	Estimated Throughput	3,511
3. Compost and Miscellaneous Organics Producers	Establishments	59
	Employment	325
	Annual Payroll	5,892
	Estimated Receipts	26,995
	Estimated Throughput	335
4. Materials Recovery Facilities (MRF's)	Establishments	28
	Employment	691
	Annual Payroll	12,328
	Estimated Receipts	43,714
	Estimated Throughput	202
5. Recyclable Material Wholesalers	Establishments	493
	Employment	6,104
	Annual Payroll	194,916
	Estimated Receipts	3,002,687
	Estimated Throughput	3,248
6. Glass Container Manufacturing Plants	Establishments	4
	Employment	1,053
	Annual Payroll	39,768
	Estimated Receipts	180,912
	Estimated Throughput	133
7. Glass Product Producers (other recycled uses)	Establishments	4
	Employment	232
	Annual Payroll	4,953
	Estimated Receipts	20,055
	Estimated Throughput	18
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	19
	Employment	1,104
	Annual Payroll	44,759
	Estimated Receipts	667,267
	Estimated Throughput	160
9. Nonferrous Product Producers	Establishments	12
	Employment	2,799
	Annual Payroll	115,896
	Estimated Receipts	863,602
	Estimated Throughput	231

<sup>3</sup> Throughput is the amount of recovered material recycled and includes manufacturing scrap sent for recycling. It excludes materials prepared for fuel use and in-house process scrap returned to the manufacturing process. Throughput estimates are not summed to avoid triple counting at collection, processing, and manufacturing stages.

## EXECUTIVE SUMMARY

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity
10. Nonferrous Foundries	Establishments	101
	Employment	4,310
	Annual Payroll	135,851
	Estimated Receipts	494,609
	Estimated Throughput	33
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	10
	Employment	1,006
	Annual Payroll	46,655
	Estimated Receipts	276,541
	Estimated Throughput	839
12. Paper-Based Product Manufacturers	Establishments	7
	Employment	143
	Annual Payroll	6,294
	Estimated Receipts	31,469
	Estimated Throughput	63
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	1
	Employment	(D)
	Annual Payroll	(D)
	Estimated Receipts	(D)
	Estimated Throughput	(D)
14. Plastics Reclaimers	Establishments	38
	Employment	1,268
	Annual Payroll	37,351
	Estimated Receipts	106,816
	Estimated Throughput	198
15. Plastics Converters	Establishments	147
	Employment	12,195
	Annual Payroll	374,780
	Estimated Receipts	1,944,071
	Estimated Throughput	180
16. Rubber Product Manufacturers	Establishments	4
	Employment	226
	Annual Payroll	11,253
	Estimated Receipts	22,505
	Estimated Throughput	54
17. Steel Mills	Establishments	9
	Employment	9,199
	Annual Payroll	407,498
	Estimated Receipts	2,943,010
	Estimated Throughput	3,735
18. Iron and Steel Foundries	Establishments	58
	Employment	5,789
	Annual Payroll	200,894
	Estimated Receipts	790,961
	Estimated Throughput	527
19. Other Recycling Processors/Manufacturers	Establishments	11
	Employment	257
	Annual Payroll	5,364
	Estimated Receipts	57,216
	Estimated Throughput	284
Recycling Industry Subtotal	Establishments	1,479
	Employment	48,800
	Annual Payroll (\$1,000)	1,717,425
	Estimated Receipts (\$1,000)	11,620,084

(continued)

## EXECUTIVE SUMMARY

Business Category	Data Type	Estimates of Total Recycling and Reuse-Related Economic Activity
<b>Reuse and Remanufacturing Industry Economic Activity</b>		
20. Computer and Electronic Appliance Demanufacturers	Establishments	9
	Employment	232
	Annual Payroll	5,240
	Estimated Receipts	22,767
	Estimated Throughput	N/A
21. Motor Vehicle Parts (used)	Establishments	217
	Employment	2,137
	Annual Payroll	51,225
	Estimated Receipts	246,427
	Estimated Throughput	N/A
22. Retail Used Merchandise Sales	Establishments	652
	Employment	3,632
	Annual Payroll	43,117
	Estimated Receipts	220,524
	Estimated Throughput	N/A
23. Tire Retreaders	Establishments	27
	Employment	487
	Annual Payroll	11,502
	Estimated Receipts	58,200
	Estimated Throughput	N/A
24. Wood Reuse	Establishments	16
	Employment	312
	Annual Payroll	7,147
	Estimated Receipts	26,058
	Estimated Throughput	N/A
25. Materials Exchange Services	Establishments	2
	Employment	(D)
	Annual Payroll	(D)
	Estimated Receipts	(D)
	Estimated Throughput	N/A
26. Other Reuse	Establishments	10
	Employment	649
	Annual Payroll	13,981
	Estimated Receipts	73,124
	Estimated Throughput	N/A
Reuse Industry Subtotals	Establishments	933
	Employment	7,449
	Annual Payroll (\$1,000)	132,212
	Estimated Receipts (\$1,000)	647,100
<b>GRAND TOTALS</b>		
Recycling and Reuse/Remanufacturing	Establishments	2,412
	Employment	56,249
	Annual Payroll (\$1,000)	1,849,637
	Estimated Receipts (\$1,000)	12,267,184

As Table ES-1 shows, Illinois hosts over 2,400 recycling and reuse establishments that employ approximately 56,000 people, generate an annual payroll of \$1.8 billion, and earn \$12 billion in annual revenues.



Insight into Illinois' recycling and reuse industry can be obtained by comparing the relative sizes of individual business categories and groups of categories that are related in terms of materials recycled or sector of the industry that they are in. Sector groupings include:

- Recycling
  - Collection;
  - Processing;
  - Manufacturing; and
- Reuse and Remanufacturing.

### COMPARISON OF INDUSTRY SECTOR SIZES

Figures ES-1 and ES-2 compare the relative sizes of the recycling collection, recycling processing, recycling manufacturing, and reuse/remanufacturing sectors of the industry. As illustrated, the economic size of the recycling manufacturing sector far exceeds the size of the recycling collection, recycling processing, and reuse sectors.

**FIGURE ES-1**  
**EMPLOYMENT BY INDUSTRY SECTOR**

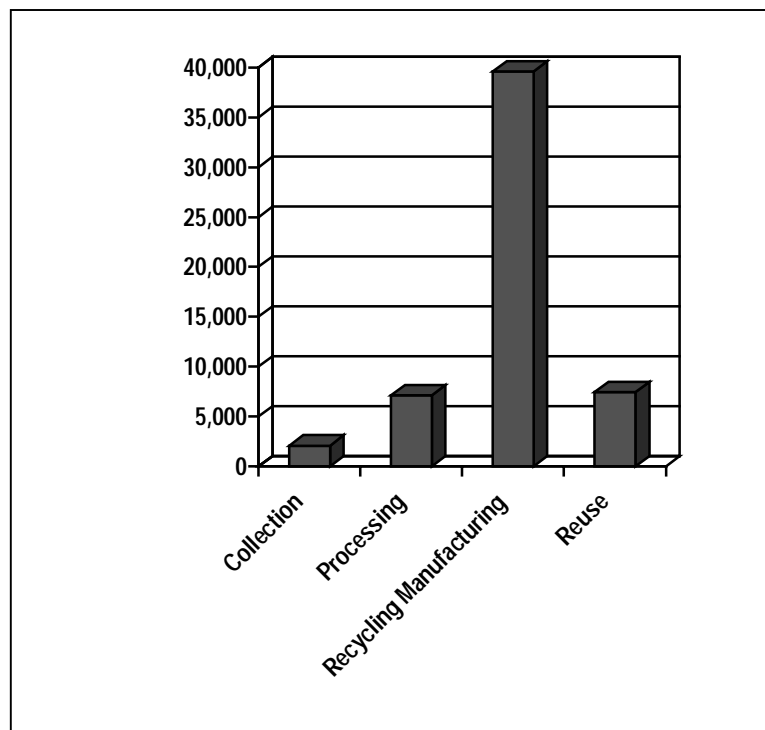
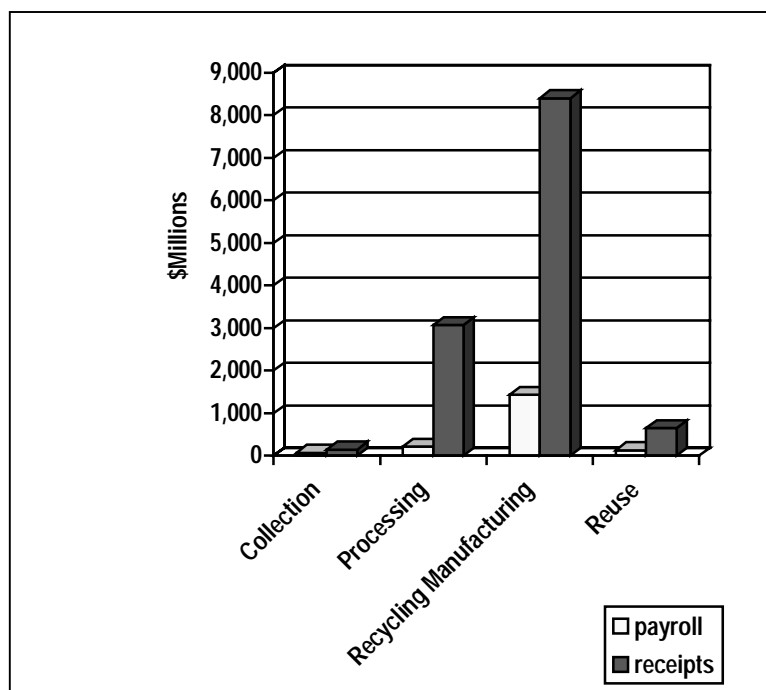


FIGURE ES-2  
PAYROLL AND RECEIPTS BY INDUSTRY SECTOR



The ultimate value of a good or service is represented by the sale price of that good or service. Sales revenues, in turn, are used to employ persons and pay their wages, make payments on equipment, provide a return to owners and investors, and pay upstream supplier establishments for the value of their goods or services. The cost in terms of labor, equipment, etc. of performing a particular process is a measure of the value that is added by that particular process.

The progression in size from recycling collection to recycling processing to recycling manufacturing follows from the fact that those sectors are part of a chain where increasingly more value is added to the recovered material as it moves through the recycling chain. Initially, a relatively small amount of value is added by consolidation (collection). Processors invest significantly more expense (value) in the recovered material by sorting and densification. However, no transformation of the recovered material has yet occurred – the material has simply been concentrated. The greatest value is added in manufacturing, where relatively useless raw materials of little value are made into useful products of considerable value.

Reuse and remanufacturing differ slightly in that they focus on consolidation and refurbishing of products (not raw materials) that still have significant value; however, the value reuse adds cannot exceed the value inherent in a new product made from raw materials – otherwise people would buy the new product. This limits the amount of value that can be added, and thus the size of the reuse sector compared to the manufacturing sector. Although the reuse and remanufacturing sector comprises 39 percent of total establishments, it makes up only 13 percent of total employees, 7 percent of payroll, and 5 percent of receipts.<sup>4</sup>

<sup>4</sup> These reuse and remanufacturing figures are thought to represent the minimum amount of economic activity captured by the methodology because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Boston University estimated remanufacturing activities on the national level (Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant*, 1996). That study suggested that reuse and remanufacturing categories may be as much as three times larger than that characterized by this study's methodology.

## COMPARISON OF RECYCLING COLLECTION AND PROCESSING TO RECYCLING MANUFACTURING

Recycling categories that are focused locally on recovering materials from commercial, industrial, and residential waste streams include establishments that collect and process recyclables for shipment to the recycling manufacturing industry. These local collection and processing establishments include the following categories of establishments:

- Government staffed residential curbside collection;
- Privately-staffed residential curbside collection;
- Compost and miscellaneous organics products producers;
- Materials recovery facilities; and
- Recyclable material wholesalers.

Alternatively, establishments in the recycling manufacturing sector are considered to be downstream consumers of recovered materials who rely on local collectors and processors for their supply of materials. When the two groups are compared, local collection and processing make up 19 percent of total recycling employment, 17 percent of recycling payroll, and 28 percent of receipts, whereas downstream manufacturing makes up the remaining 81 percent of employment, 83 percent of payroll, and 72 percent of receipts. This suggests that significant downstream private recycling economic activity is supported by: (1) public policies that encourage recycling and discourage disposal; and (2) public and private investment in local recyclables collection and processing infrastructure.

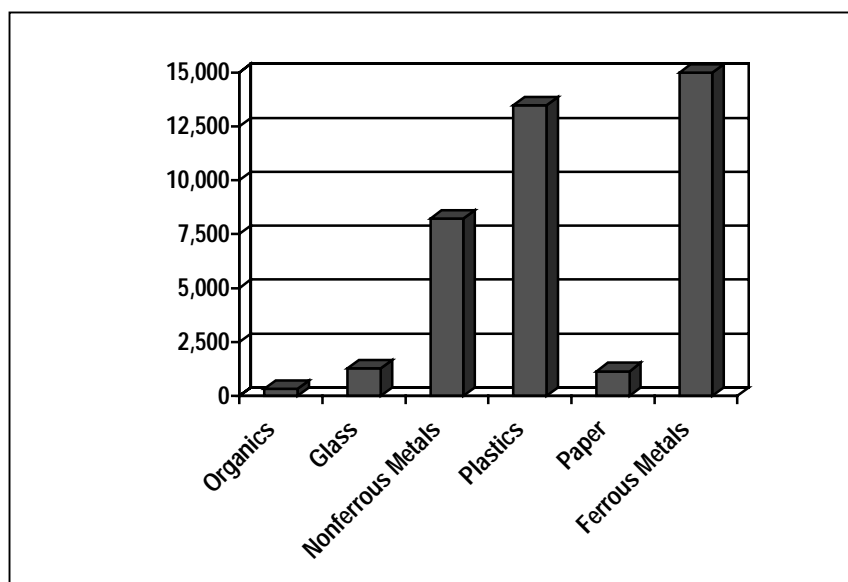
## LARGEST CONTRIBUTORS

Upon closer examination, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four categories of establishments:

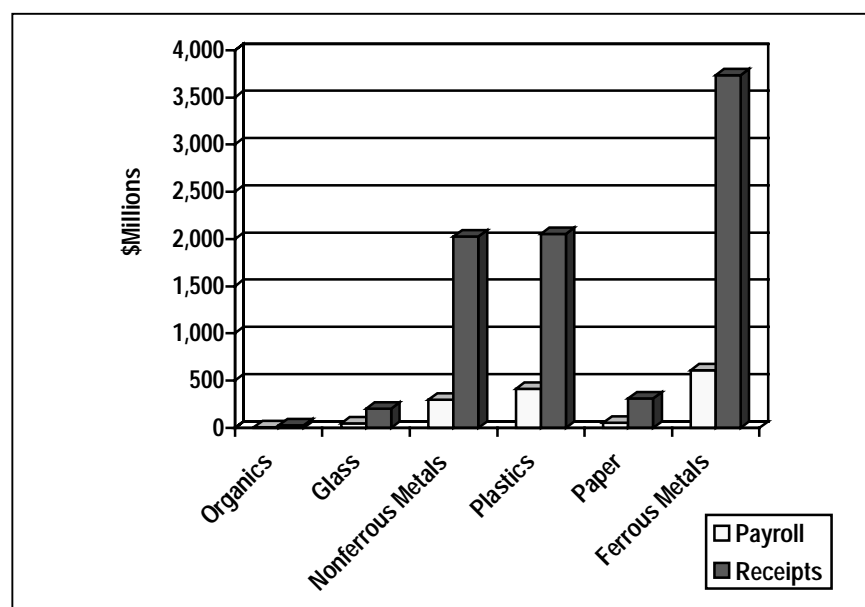
- Plastics converters, which employ 12,195 people and gross \$1.9 billion in annual receipts;
- Steel mills, which employ 9,199 people and gross \$2.9 billion in annual receipts;
- Recyclable material wholesalers, which employ 6,104 people and gross \$3.0 billion in annual receipts; and
- Iron and steel foundries, which employ 5,789 employees and gross \$0.8 billion in annual receipts.

These four categories alone account for 59 percent of all employees, 64 percent of wages, and 71 percent of total receipts. Figures ES-3 and ES-4 place this information into further perspective by showing how the size of Illinois' major recyclable materials manufacturing industries compare to each other. As the figures show, the metals and plastics recycling manufacturing industries contribute predominantly to recycling manufacturing's overall size.

**FIGURE ES-3**  
**RECYCLING MANUFACTURING INDUSTRY EMPLOYMENT BY MAJOR MATERIAL GROUP**



**FIGURE ES-4**  
**RECYCLING MANUFACTURING INDUSTRY PAYROLL AND RECEIPTS BY MAJOR MATERIAL GROUP**



The amount of materials recycled, in combination with the underlying value of each raw material, helps explain why some major material groups shown in Figures ES-3 and ES-4 rank higher than others. When large quantities of a high-value commodity are returned to the stream of commerce, the large amount of intrinsic value returned to the economy can support more jobs and economic activity than if a lesser amount or lower value commodity is returned to the stream of commerce. Plastics and non-ferrous metals are at the top of the value scale, ferrous metals and paper are in the middle, and glass and compost are at the low end of the value scale. Major material group recycling amounts as estimated by this study are:

- Yard waste – 335 thousand tons (recycling of other organic materials is negligible);

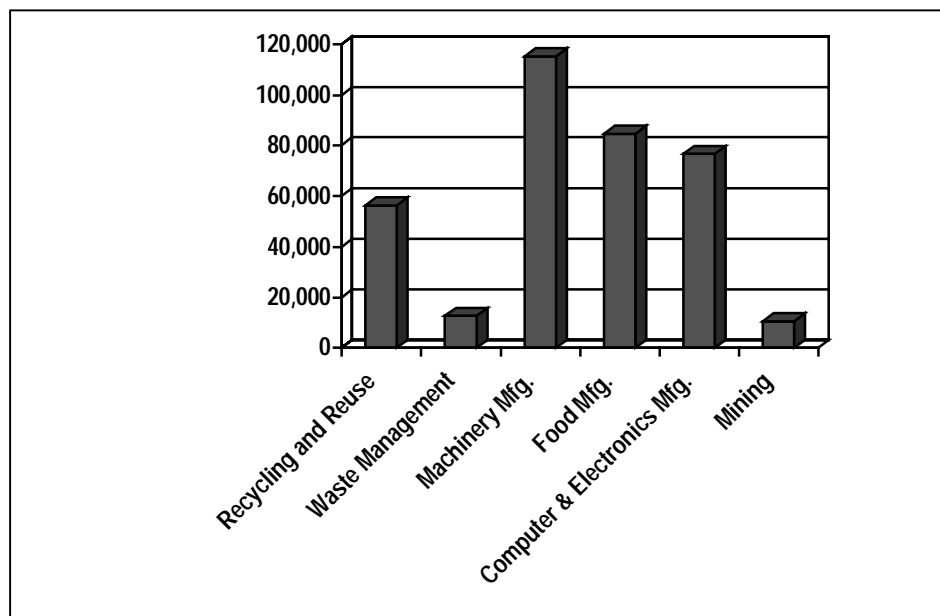
- Glass – 151 thousand tons;
- Nonferrous metals – 424 thousand tons;
- Plastics – 378 thousand tons;
- Paper – 902 thousand tons; and
- Ferrous metals – 4,262 thousand tons.

When both the amount recycled and value are considered together, the relative sizes of the various material groups can be explained. Similarly, estimates can be made of the economic impact that results from increased diversion of the various materials.

## THE RECYCLING AND REUSE INDUSTRY IN PERSPECTIVE

Figures ES-5, ES-6, and ES-7 show how Illinois' recycling and reuse industry compares to other select state industries.<sup>5</sup> These industries were chosen because they present alternatives to recycling and reuse (i.e., waste management and mining) or because they are considered to be important or preferred industries that are often targeted by economic developers.

**FIGURE ES-5**  
**COMPARISON OF INDUSTRY EMPLOYMENT**



<sup>5</sup> Comparative industry information comes from the 1997 Economic Census (U.S. Census Bureau) for the following industries: waste management – NAICS 562 waste management and remediation services minus 56292 materials recovery facilities; machinery manufacturing – NAICS 333; food manufacturing – NAICS 311; computer and electronics manufacturing – NAICS 334; mining – NAICS 21.

FIGURE ES-6  
COMPARISON OF ANNUAL WAGES PER JOB

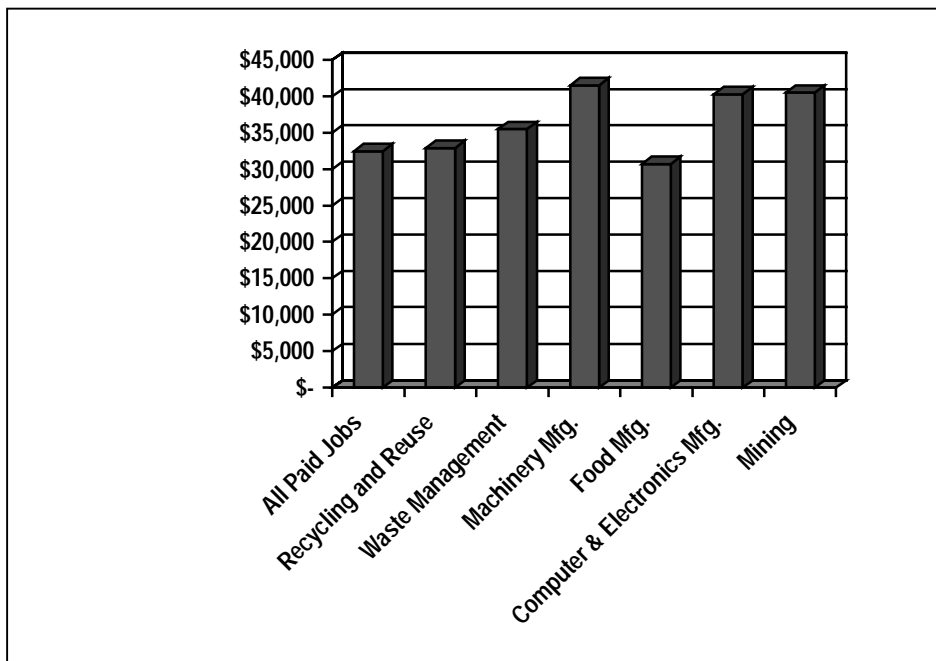
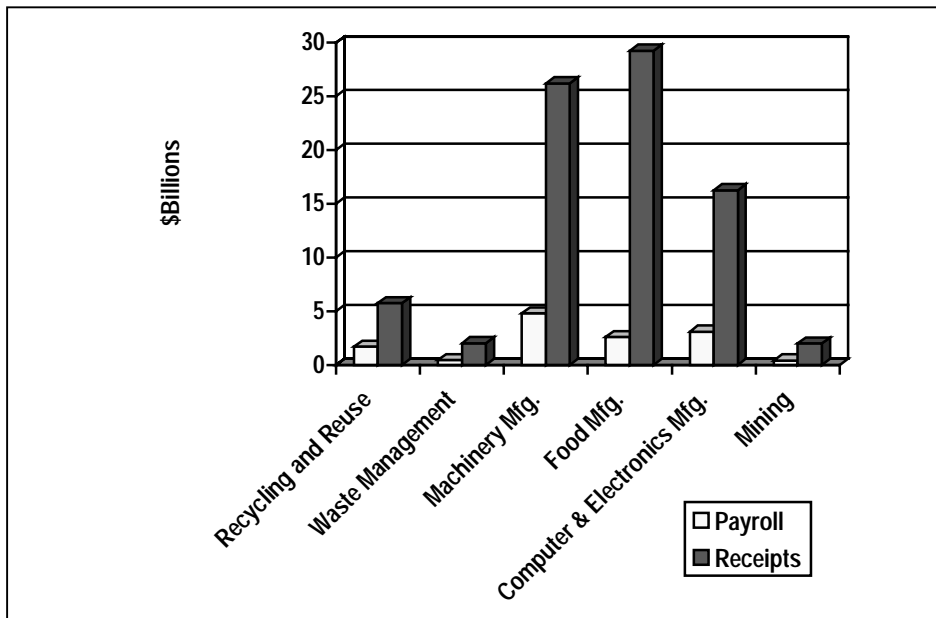


FIGURE ES-7  
COMPARISON OF TOTAL WAGES AND SALES



As the three figures show, the recycling and reuse industry is a significant industry to Illinois, providing jobs that pay slightly more than the state average. Although significantly more discards are disposed rather than recycled, the recycling and reuse industry is larger than the waste management industry.

## SUMMARY OF OTHER ECONOMIC ACTIVITY SUPPORTED

In addition to the twenty-six categories of direct recycling and reuse establishments, the study estimated data for specific categories of support businesses that provide goods or services to recycling and reuse industry establishments as shown in Table ES-2.

**TABLE ES-2**  
**ESTIMATES OF INDIRECT ECONOMIC ACTIVITY OF SUPPORT BUSINESS CATEGORIES**

(ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000)

Business Category	Data Type	Value
Recycling and Reuse Equipment Manufacturers <sup>[1]</sup>	Employment	1,708
	Annual Payroll	49,479
	Estimated Receipts	367,589
Consulting/Engineering <sup>[2]</sup>	Employment	383
	Annual Payroll	19,171
	Estimated Receipts	39,380
Transporters <sup>[2]</sup>	Employment	1,898
	Annual Payroll	180,981
	Estimated Receipts	252,437
Other Indirect Establishments <sup>[2]</sup>	Employment	36,763
	Annual Payroll	1,456,970
	Estimated Receipts	5,090,330
Support Businesses Totals	Employment	40,752
	Annual Payroll (\$1,000)	1,706,600
	Estimated Receipts (\$1,000)	5,749,735

<sup>[1]</sup> Data for Recycling and Reuse Equipment Manufacturers are based on a statistical analysis of survey results.

<sup>[2]</sup> Data come from economic modeling and reflect the indirect activity stimulated by the 26 direct categories of recycling and reuse establishments targeted by this study for direct data.

The general category Other Indirect Establishments shown in the table includes all other indirect establishments that provide goods or services (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.). It is important to note that the data for Recycling and Reuse Equipment Manufacturers is based on a statistical analysis of survey data and therefore represents complete data for those types of establishments regardless of where they sell their equipment. Totals for the other categories represent indirect activity relating to only the 26 categories of recycling and reuse industry establishments that were investigated in this study.

The study also estimated other economic activity produced in the Illinois economy as a result of recycling and reuse industry employees spending their wages. Economic modeling estimated that employee spending supports 40,000 jobs with a payroll of \$1.3 billion, and produces receipts of \$4.6 billion.

State and local government tax revenues arising from the recycling and reuse industry were also estimated. Table ES-3 shows tax revenue estimates for the direct economic activity of the 26 business categories, and total government tax revenues arising from other all other economic activity attributable to the industry and its employees.

**TABLE ES-3**  
**SUMMARY OF RECYCLING & REUSE INDUSTRY CONTRIBUTION TO GOVERNMENT REVENUES**  
 (IN \$ MILLIONS)

Industry Sector	Direct Revenues		Total Revenues	
	State	Local	State	Local
Recycling Collection	6	6	8	8
Recycling Processing	16	15	30	29
Recycling Manufacturing	105	102	281	272
Reuse/Remanufacturing	10	10	28	27
<b>Total</b>	<b>137</b>	<b>133</b>	<b>347</b>	<b>335</b>

## INDUSTRY GROWTH SCENARIOS

Three recycling and reuse industry growth scenarios were analyzed for this study:

- Achieving a 35 percent state recycling rate;
- Achieving a 50 percent state recycling rate; and
- Banning the disposal of electronics in Illinois landfills.

Table ES-4 summarizes the results of this analysis, and presents estimated direct and total economic impacts associated with each growth scenario. These estimated impacts are for true economic growth, net of offsets in other sectors of the Illinois economy (such as reduced economic activity at landfills).

**TABLE ES-4**  
**ESTIMATED ECONOMIC IMPACTS OF INDUSTRY GROWTH SCENARIOS**  
 ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Data Type	Direct Impacts by Industry Sector					Total Impacts <sup>1</sup>
	Recycling Collection	Recycling Processing	Recycling Manufacturing	Reuse and Remanufacturing	Direct Industry Total	
35 Percent Recycling Rate						
Establishments	0	104	15	2	121	N/A
Employment	1,324	5,180	1,123	0	7,627	16,042
Annual Payroll	45,798	131,706	45,368	0	222,873	456,796
Estimated Receipts	46,307	2,356,388	354,614	0	2,757,308	4,931,119
Estimated Throughput	3,735	3,735	1,223	N/A	N/A	N/A
50 Percent Recycling Rate						
Establishments	0	288	19	6	313	N/A
Employment	1,740	9,156	1,638	26	12,560	26,574
Annual Payroll	60,185	241,785	67,502	582	370,054	744,652
Estimated Receipts	60,853	4,577,104	501,555	2,530	5,142,041	9,211,449
Estimated Throughput	6,861	6,861	1,635	N/A	N/A	N/A
Electronics Landfill Ban						
Establishments	0	0	7	16	23	N/A
Employment	285	402	703	422	1,813	3,913
Annual Payroll	9,885	12,702	21,732	9,534	53,853	124,397
Estimated Receipts	12,873	202,345	161,517	41,426	418,161	743,889
Estimated Throughput	225	225	205	N/A	N/A	N/A

<sup>1</sup> Includes net economic impacts in other sectors of the economy stimulated by business spending for goods and services by recycling and reuse industry, and personal spending by employees of their wages.

As Table ES-4 shows, the greatest impacts of industry growth are seen in recycling collection and processing, rather than in recycling manufacturing. This result reflects the fact that recycling manufacturing is undertaken not as a recycling service, but in order to produce



goods for consumption by in-state purchasers or for export to other states and countries. If using recycled materials in place of alternate raw materials can make Illinois manufacturers more competitive than out-of-state manufacturers, recycling manufacturing in Illinois can grow. Otherwise, materials substitution does not result in economic growth.

Table ES-5 summarizes the costs and benefits (in terms of tax revenues) of the three future growth scenarios investigated in this study.

**TABLE ES-5**  
**COST-BENEFIT COMPARISON OF FUTURE GROWTH SCENARIOS**

ALL VALUES ARE IN ARE IN \$MILLIONS

	Government		Commercial Sector	Total
	State	Local		
35 Percent Recycling Rate				
Costs				
Net Additional Cost to Achieve 35% <sup>1</sup>	2	24	18	44
Benefits				
Recycling and Reuse Industry Tax Payments	17	16	0	33
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	43	41	0	84
50 Percent Recycling Rate				
Costs				
Net Additional Cost to Achieve 50% <sup>1</sup>	5	44	50	99
Benefits				
Recycling and Reuse Industry Tax Payments	28	27	0	55
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	70	68	0	138
Electronics Landfill Ban				
Costs				
Net Additional Cost of an Electronics Landfill Ban <sup>1</sup>	2	41	0	43
Benefits				
Recycling and Reuse Industry Tax Payments	4	4	0	8
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	10	10	0	20

<sup>1</sup> Net of avoided disposal cost savings.

<sup>2</sup> Included taxes from additional economic activity in other sectors of the economy stimulated by business spending for goods and services by the recycling and reuse industry, and personal spending by employees of their wages.

As Table ES-5 shows, the greatest costs are incurred by local governments and/or the commercial sector in achieving the recycling results of each scenario. Tax revenues, alternatively, are nearly equally split between the state and local governments. Although not quantified, it should be noted that the federal government also benefits from increased tax revenues resulting from economic growth.

In addition to the costs and benefits listed in Table ES-5, there are other benefits to recycling that have not been quantified in this study, including:

- Disposal tip fee cost savings;
- Job creation;
- Extending landfill life;
- Energy savings;
- Greenhouse gas reduction;
- Atmospheric and waterborne emissions reductions; and
- Resource conservation.

The State of Illinois must consider the relative importance of these additional benefits, compared to those that were quantified, as it steers the course into the future of waste reduction and recycling in Illinois.

## CONCLUSIONS

The recycling and reuse industry contributes significantly to the Illinois economy, providing large numbers of good jobs that pay well, as shown by the following statistics:

- The average wage paid by the recycling and reuse industry is \$32,900 – about \$400 more per year than the average Illinois wage.<sup>6</sup>
- The recycling and reuse industry supports 2.2 percent of the paid jobs in Illinois – 0.9 percent through direct employment, and 1.3 percent by industry and employee spending in the economy.<sup>6</sup>
- Some 1.9 percent of the Illinois gross state product is attributable to the recycling and reuse industry, with 0.7 percent provided directly by the industry.<sup>7</sup>

Recycling manufacturing establishments are critical to the strength of Illinois' current recycling and reuse industry and overall state economy. This industrial sector has a demand for more recovered materials than are recovered in the state – thus materials must be imported from other states and countries. Many of the intermediate products of recycling manufacturing establishments support other manufacturing jobs in the state or result in the flow of profits into the state from the sale of those products outside Illinois' borders. Illinois' economy significantly benefits from this industrial sector in terms of the jobs it provides, support it gives to the state's manufacturing base and other economic sectors, and tax revenues that flow to the state.

By implementing programs and policies to achieve higher recycling rates, Illinois can expand its economy and provide additional jobs for its citizens. It is projected that many of these jobs will be in the recycling collection and recycling processing sectors of the industry, although there will also be increases in the recycling manufacturing and reuse/remanufacturing sectors as well as the broader state economy. For example, it is estimated that implementing programs and policies to achieve a 50 percent recycling rate in the state will result in an additional 12,600 jobs in the recycling and reuse industry itself, and an additional 14,000 jobs in the broader Illinois economy.

As noted previously, investments at the local level in collection and processing of recyclables and public policies that favor recycling and reuse certainly support large private sector investments in downstream processing and manufacturing. However, further study is necessary to assess specific opportunities and conditions for expanding recycling manufacturing in Illinois.

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<sup>6</sup> Average wage and total jobs data come from the U.S. Bureau of Economic Analysis, regional accounts data, regional economic profile for the U.S. for 1997 wage and salary jobs.

<sup>7</sup> Gross national product data comes from the U.S. Bureau of Economic Analysis, "Gross State Product in Current Dollars, 1992-1998" table using data for 1997.

## **1.1 OVERVIEW**

This report presents the results of the Illinois Recycling Economic Information (REI) Study that was commissioned by the Illinois Department of Commerce and Community Affairs (DCCA). The goal of the study was to document the size of the recycling and reuse industry by first determining direct economic information for each of twenty-six categories of recycling and reuse establishments. The direct economic values that were measured included:

- Number of establishments;
- Employment;
- Annual payroll;
- Annual receipts; and
- Annual throughput (for applicable categories).

Next, similar information was estimated for four categories of supporting establishments intimately involved in the recycling and reuse industry. Finally, the broader effect of recycling and reuse businesses and their employees on the economy was derived through economic modeling using direct data as inputs. This information included:

- Indirect economic values (inter-industry linkages as measured by purchase of intermediate commodities);
- Induced economic values (personal spending by employees of direct and indirect establishments);
- Multipliers to calculate total economic values (the sum of direct, indirect, and induced) from direct economic values; and
- Tax revenues attributable to the recycling and reuse industry.

Finally, the study projected the economic effects of three industry growth scenarios. The analyses included an estimate of the required investment in recycling associated with each of the scenarios. The three scenarios were:

- Achieving a 35 percent state recycling rate;
- Achieving a 50 percent state recycling rate; and
- Banning the disposal of electronics in Illinois landfills.

## **1.2 COMPARISON TO SIMILAR STUDIES**

This REI study conforms to the methodology for gathering economic data on the recycling and reuse industries that was developed by the Northeast Recycling Council (NERC) and that has been used in many other state and national REI studies. As a result, the information contained in this report is generally comparable to that of REI studies conducted for:

## SECTION 1

- The Northeast Recycling Council,<sup>8</sup> including the ten-state region as a whole and state-level data for Delaware, Massachusetts, New Jersey, New York, Pennsylvania, and Vermont;
- States that commissioned state-level studies as part of this study, including California, Florida, Indiana, Nebraska, and Ohio<sup>9</sup>; and
- Other states that conform to the specified REI methodology.<sup>10</sup>

At least seven other recycling economic information studies had been performed before NERC developed a standard REI study methodology. Although those existing studies quantified employment and most included other industry size estimates (such as annual sales or value-added), they used varying (and sometimes inconsistent) data collection methodologies and industry definitions. Therefore, care should be taken if attempting to compare the results of this study to previous studies. Table 1-1 lists the types of data collected in this study compared to three previous economic information studies.

**TABLE 1-1**  
**COMPARISON OF DATA PRESENTED IN OTHER RECYCLING ECONOMIC INFORMATION STUDIES**

Name of Study	Types of Data Presented						
	Recycling Collection	Recycling Processing	Recycling End Use	Reuse	Support Businesses	Multipliers	Tax Revenues
Illinois REI Study (2001)	●	●	●	●	●	●	●
Selected Previous Studies							
Assessment of Economic Impacts of Recycling in Iowa; Recycle Iowa Program (1996, 2001 Update)		●	●				●
Arizona Recycling Market Development Study; Arizona Department of Commerce (1996)	●	●	●			●	
Value Added to Recyclable Materials in the Northeast; NERC (1994)	●	●	●				

### 1.3 INTENDED USES FOR THE STUDY

Recycling and reuse businesses, like other businesses, provide a number of economic benefits, including creating jobs, making investments, and paying taxes. This study and the economic benefit information it contains may be used as a:

- Reference for economic development agencies, entrepreneurs, and financiers to understand and evaluate recycling and reuse businesses;
- Reference for lawmakers to assist them in evaluating legislation that would affect recycling and reuse;

<sup>8</sup> "Recycling Economic Information Study," Northeast Recycling Council, June 2000.

<sup>9</sup> "California Recycling Economic Information Study," California Integrated Waste Management Board, June 2001; "Florida Recycling Economic Information Study," Florida Department of Environmental Protection, June 2000; "Indiana Recycling Economic Information Study," Indiana Department of Commerce, May 2001; "Ohio Recycling Economic Information Study," Ohio Department of Natural Resources, January 2001; "Nebraska Recycling Economic Information Study," Nebraska Department of Economic Development, March 2001.

<sup>10</sup> Arizona, Iowa, Minnesota, Missouri, and Wisconsin all conducted studies in 2000/2001 that made use of at least some of the tools and methodology found in "Recycling Economic Information Study", Northeast Recycling Council, June 2000.

- Tool for recycling advocates to increase understanding of the industry, promote awareness of recycling and reuse, and target resources for growth; and
- Baseline of economic information to document future growth and development of the industry.

## 1.4 REPORT ORGANIZATION

This report is organized into the following sections:

1. **Introduction**, which provides a brief overview of the development of the REI study, comparison to similar studies, and intended uses of the study;
2. **Data Characterization**, which briefly describes the development of the business categories, types of data, approaches to data development, and the included activities and boundaries of the study;
3. **Study Methodology**, which explains the methodology used in developing estimates for each category and data type;
4. **Study Results**, which presents detailed data tables and related notes for each sponsoring state and the region as a whole;
5. **Indirect and Induced Economic Information**, which presents the multipliers and related results of economic modeling; and
6. **Recommendations for Future Studies**, which provides suggestions for replication of the study.

The following appendices contain additional detail to support and further explain the methodology and results:

- A. Description of Recycling and Reuse Business Categories
- B. Evaluation of Data Sources
- C. Sample of Raw Data from U.S. Census Bureau's *Economic Census*
- D. Survey Materials
- E. State Data Tables
- F. Statistical Analysis of Survey Results
- G. Glossary of Terms

## **2.1 STUDY BOUNDARIES**

Defining the recycling and reuse industry is complex. For example, one establishment may perform a variety of processing and/or manufacturing activities, only some of which are related to recycling or reuse. So the question arises whether the establishment should be included, and if so, what portion of that establishment's activities should be attributed to recycling/reuse. In the case of product manufacturing, both recycled and non-recycled materials may be used, again raising the question whether the total activity should be included or only a partial amount.

The most challenging issue that recycling economic information studies face is defining the extent of economic information to include when an industry is able to utilize recovered as well as virgin feedstock or makes an intermediate product as well as converts those intermediate products to end-products within the same facility.

Consistent with the methodology developed by NERC on behalf of the EPA, this study includes those activities that are most essential to the continued recycling of materials and reuse of used products. The study boundaries:

- Include all “supply side” activities involved in recovering and preparing materials and used products for resale;
- Include “demand side” activities up to the first point at which the recovered materials or used products have successfully competed directly against their respective primary, or virgin, equivalents;
- Exclude the activities of non-business entities such as individuals, and of advocacy, education and other organizations which do not directly add value to recovered materials and used products, or directly support such activities; and,
- Exclude activities involving incineration or use of materials as fuel.

“Recycling and Reuse” as defined in this study includes the following “covered activities”:

- Collecting materials or used products for the purposes of intermediate processing, manufacturing, and/or distribution by reuse sales establishments;
- Intermediate processing of recovered materials or used products including sorting, cleaning, consolidating, treating, disassembling, densifying, and/or transferring ownership for use in processing, product manufacturing, and/or for distribution by reuse sales establishments;
- Reclaiming of recovered materials or used products to produce refined raw materials and/or reusable products meeting the specifications of manufacturers, reuse sales establishments or other end-users;
- Manufacturing “first-stage” products containing recycled materials or used products;
- Operating wholesale or retail sales establishments that offer, largely or exclusively, used products prepared for reuse; and
- Intimately supporting the above activities through research, equipment development and sales, consulting, engineering, brokering, and exchange services.

The end-point of recycling is considered to be the “first-stage” manufactured product. “First-stage” refers to the first product produced from recycled materials, such as a roll of paper,

sheet of plastic, glass bottle or metal billet. First-stage products are often converted into finished products (e.g., envelopes, plastic bottles, or metal parts), sometimes at the same facility. Only production of first-stage products is intended to be included in this definition. At this stage, the recycled material has successfully competed against virgin material and is often indistinguishable from other first-stage products that are made from those virgin materials. This study attempted to exclude economic activity associated with further conversion within the same facility as these are essentially manufacturing rather than recycling activities.

## 2.2 BUSINESS CATEGORIES

This report presents recycling and reuse industry data for twenty-six separate business categories. Data is also presented for four categories of support businesses because of their intimate involvement in the industry. The business categories are grouped into three major sectors:

- **Recycling Industry:** includes all collection and processing of recovered materials and manufacturing using recycled materials;
- **Reuse and Remanufacturing Industry:** includes preparation of materials for reuse and remanufacturing of used or broken equipment; and
- **Support Businesses:** businesses that do not directly recycle materials or reuse products, but provide specialized equipment and services necessary to the recycling and reuse industry.

Table 2-1 briefly defines each of the 30 business categories as used in this study. For more detailed definitions, please see Appendix A.

**TABLE 2-1  
BUSINESS CATEGORY DEFINITIONS**

Business Category		Definition
<b>Recycling Industry</b>		
1.	Government Staffed Residential Curbside Collection	Recyclables collection using government employees
2.	Private Staffed Residential Curbside Collection	Private sector collection of recyclables, including contract collection on behalf of municipalities
3.	Compost and Miscellaneous Organics Producers	Produce compost, mulch, bark, or bedding from yard and wood waste, biosolids, or other organics, also includes vermiculture
4.	Materials Recovery Facilities	Process commingled or recovered materials, usually from curbside/drop-off collection or recyclables separated from solid waste
5.	Recyclable Material Wholesalers	Paper stock dealers, scrap metal processors, and other establishments that sort, remove contaminants, and densify recovered materials
6.	Glass Container Manufacturing Plants	Produce finished glass containers
7.	Glass Product Producers (other recycled uses)	Produce glass products other than containers
8.	Nonferrous Secondary Smelting and Refining Mills	Recycling and alloying of nonferrous metals, primary products include billets, ingots, and other basic shapes
9.	Nonferrous Product Producers	Produce nonferrous products through extrusion, rolling, or drawing processes
10.	Nonferrous Foundries	Produce castings from nonferrous metals

Business Category	Definition
11. Paper, Paperboard, and Deinked Market Pulp Mills	Produce paper and paperboard products from recovered paper or market pulp and/or deink recovered paper and sell pulp
12. Paper-based Product Manufacturers	Produce cellulose-based products from recovered paper or paperboard (e.g., cellulose insulation, hydro-seeding, animal bedding)
13. Pavement Mix Producers (asphalt and aggregate)	Produce asphalt paving mix from recycled materials such as crumb rubber, aggregates, or glass
14. Plastics Reclaimers	Transform recovered plastics directly into products (e.g., plastic lumber) or raw materials ready for remanufacture
15. Plastics Converters	Convert a recycled plastic clean flake or pellet into an intermediate or end product
16. Rubber Product Manufacturers	Manufacture products using crumb rubber or cut rubber shapes and stampings as feedstock
17. Steel Mills	Produce iron and steel slabs, billets, bar, plate, and sheet from scrap and/or raw materials
18. Iron and Steel Foundries	Produce cast iron or steel products
19. Other Recycling Processors/Manufacturers	Other processors and manufacturers not elsewhere classified, using ash, sludge, engineering application of tires or other recovered materials
<b>Reuse and Remanufacturing Industry</b>	
20. Computer and Electronic Appliance Demanufacturers	Sort, grade, dismantle and/or rebuild used electronic appliances
21. Motor Vehicle Parts (used)	Clean, sort, inspect, and remanufacture used automobile parts
22. Retail Used Merchandise Sales	Retail thrift stores, antique shops, reuse centers, and other shops dedicated to selling used merchandise
23. Tire Retreaders	Remove old tread from worn tires and add new tread
24. Wood Reuse	Process used wood for reuse (e.g., pallet rebuilders, construction materials)
25. Materials Exchange Services	Facilitate the reuse of products and materials by commercial and industrial establishments
26. Other Reuse	Other reuse or remanufacturing, not elsewhere classified
<b>Support Businesses</b>	
27. Recycling and Reuse Equipment Manufacturers	Produce new primary equipment designed for use by recycling businesses – conveyers, balers, wash systems, sorting systems
28. Consulting/Engineering	Provide technical research, development, and engineering services to recycling and reuse establishments
29. Brokers	Buy and sell recovered materials or reusable products without processing or otherwise adding value
30. Transporters	Transport recovered materials or reusable goods by air, rail, water, or truck



### 2.3 TYPES OF INFORMATION DEVELOPED

The two types of economic information developed in the study were:

- **Direct Economic Information:** Information directly derived from the establishments in each business category and necessary to document industry size; and
- **Total Economic Information:** Information on the economic values that recycling and reuse establishments induce in the greater economy at the state level, including state tax revenue impacts.

In deriving the direct information, five primary data types were developed:

- **Number of Establishments:** An establishment is a single physical location where business is conducted or where services or industrial operations are performed;
- **Employment:** Consists of full and part-time employees, including salaried officers and executives of corporations;
- **Total Annual Payroll:** Includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in kind (e.g., free meals and lodgings) paid during the year to all employees;
- **Total Annual Receipts:** Revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Excludes all revenue collected for local, state, and federal taxes; and
- **Total Throughput:** Total tons of recovered materials collected or processed. This data type was not gathered for reuse and support business categories because reuse businesses typically do not track throughput data in a manner comparable to recycling businesses (e.g., they may use the number of units remanufactured rather than tons).

The total economic information, developed through economic modeling, generated four secondary data types:

- **Indirect Economic Values:** Economic activity accrued by other establishments (suppliers and customers) as a result of the activities of the recycling and reuse businesses;
- **Induced Economic Values:** Economic activity accrued by retail and other establishments because of personal purchases by recycling and reuse industry and indirect establishment employees;
- **Multipliers:** The ratio of total values (direct, indirect, and induced) to direct values; and
- **Tax Revenues:** State revenues derived from taxes, charges and fees, and miscellaneous revenues.

### 3.1 OVERVIEW

This chapter provides a detailed description of the methodologies used to develop the economic activity estimates shown in Sections 4 and 5. This section includes general descriptions of strategies for data gathering and analysis employed in the study. Notes on the specific methodology for the direct data for each category are shown in Section 4 along with the results of the study.

### 3.2 APPROACHES TO DIRECT DATA DEVELOPMENT

In developing the direct economic information reported in Section 4, one of three methods was employed for each business category, depending on the availability and adequacy of existing information and business lists:

- **Existing Data:** Obtained through existing sources of information (e.g., U.S. Census Bureau's Economic Census, U.S. Geological Survey's Mineral Commodity Reports, expert opinions by industry and trade associations);
- **Survey Data:** Gathered by surveying the businesses directly and compiling the data into a database of establishments; or
- **Derivation:** Limited existing data was used to derive estimates of economic activity.

The study focused on using existing data, of sufficient quality, and with categories defined consistently with the study, for as many business categories as possible to avoid duplicating efforts if sources of existing information were available. If little or no existing information was available but listings of businesses in a category were available, the next option was to develop a database of businesses and conduct surveys to obtain the desired economic information. When limited existing information was available, but no specific list of establishments could be found for purposes of surveying, estimates were derived based on limited existing data and estimations by industry experts.

Due to the number of different business categories included in this study, the exact methodology used to calculate economic activity for each category was tailored to fit the material flows and processes found in each. Table 3-1 lists the business categories and the approach used for each category.

**TABLE 3-1**  
**DATA DEVELOPMENT APPROACH BY CATEGORY**

<b>Business Category</b>		<b>Approach</b>
<b>Recycling Industry</b>		
1.	Government Staffed Residential Curbside Collection	Derivation
2.	Private Staffed Residential Curbside Collection	Derivation
3.	Compost and Miscellaneous Organics Producers	Survey
4.	Materials Recovery Facilities	Survey
5.	Recyclable Material Wholesalers	Existing Data
6.	Glass Container Manufacturing Plants	Existing Data
7.	Glass Product Producers (other recycled uses)	Survey
8.	Nonferrous Secondary Smelting and Refining Mills	Existing Data
9.	Nonferrous Product Producers	Existing Data
10.	Nonferrous Foundries	Existing Data
11.	Paper, Paperboard, and Deinked Market Pulp Mills	Existing Data
12.	Paper-Based Product Manufacturers	Survey
13.	Pavement Mix Producers (asphalt and aggregate)	Survey
14.	Plastics Reclaimers	Existing Data
15.	Plastics Converters	Existing Data
16.	Rubber Product Manufacturers	Survey
17.	Steel Mills	Existing Data
18.	Iron and Steel Foundries	Existing Data
19.	Other Recycling Processors/Manufacturers	Survey
<b>Reuse and Remanufacturing Industry</b>		
20.	Computer and Electronic Appliance Demanufacturers	Survey
21.	Motor Vehicle Parts (used)	Existing Data
22.	Retail Used Merchandise Sales	Existing Data
23.	Tire Retreaders	Existing Data
24.	Wood Reuse	Survey
25.	Materials Exchange Services	Survey
26.	Other Reuse	Survey
<b>Support Businesses</b>		
27.	Recycling and Reuse Equipment Manufacturers	Survey
28.	Consulting/Engineering	Modeling
29.	Brokers	Existing Data
30.	Transporters	Modeling

The breakdown of the number of categories served by each approach is:

- Existing Data – 14;
- Survey Data – 12;
- Derivation Data – 2; and
- Modeling – 2.

Each of the three approaches is described in greater detail in the following subsections. Furthermore, Appendix B summarizes data sources used for compiling the survey database or otherwise used for producing direct data for this study.

After the direct economic values were developed, total economic values were estimated through economic modeling using the direct data as inputs. In order to apply the economic

model accurately, certain categories required additional information, known as intermediate inputs. To derive the total economic values, the following steps were taken:

- Survey for Intermediate Inputs – A detailed survey of a limited number of establishments was conducted to obtain estimates of the amounts of expenditures on inputs such as raw materials, chemicals, electricity, accounting services and other items necessary for production (usually expressed as a dollar amount per \$1,000 in output for a particular type of industry); and
- Conduct Economic Modeling – A process based on an input-output approach developed by the U.S. Bureau of Economic Analysis. Several models have been developed, including RIMS II, IMPLAN, and REMI. The model chosen for this study was the IMPLAN.

### **3.2.1 EXISTING DATA**

The first strategy employed was to utilize existing data from public sources or trade associations. The most common example of this strategy was the use of U.S. Census Bureau reports when a category defined in the study aligned well with a distinct census category. Reports from the U.S. Census included the 1997 Economic Census, which provides number of establishments, number of employees, payroll, and receipts for each category of establishment. Recovered material consumption by each category is also reported on the national level in those reports. Other sources of publicly available data included U.S. Geological Survey reports and reports developed by individual state governments.

#### **3.2.1.1 RELATION OF SIC AND NAICS TO BUSINESS CATEGORIES**

The U.S. Department of Commerce, Bureau of the Census compiles and reports a wide range of economic data on U.S. industrial activity. Up until 1997, the Census Bureau categorized businesses according to the Standard Industrial Classification (SIC) system developed by the Executive Office of the President, Office of Management and Budget. The system classified establishments by their primary activity. Beginning in 1997, the SIC system is being phased out and will be replaced by the new North American Industrial Classification System (NAICS). The new system harmonizes systems used in Mexico and Canada, in accordance with the North American Free Trade Agreement.

Table A-1, in Appendix A, attempts to classify each business category in the study by SIC and NAICS category code. The codes were assigned by comparing each business category to the definitions listed in the SIC and NAICS manuals. In many cases, the listed codes also include businesses not involved in recycling and reuse.

#### **3.2.1.2 USE OF U.S. DEPARTMENT OF COMMERCE, BUREAU OF CENSUS STATISTICS**

The primary source of U.S. Census data used for this study was the 1997 Economic Census for relevant NAICS codes, which was the most recent data available from the U.S. Census when this study was conducted. Although the Economic Census is only updated every five years, the U.S. Census updates its Standard Statistical Establishments List (SSEL) yearly, which could provide more current data than the Economic Census for future studies. See Appendix C for a sample of data provided by U.S. Census.

#### **3.2.1.3 ADDITIONAL SOURCES OF EXISTING DATA**

Although the most commonly used existing data was the U.S. Census 1997 Economic Census, other sources provided throughput data or partial data for use in derivations or adjustments to original data. These sources of existing information and their contributions include:

- American Forest & Paper Association – State and national throughput data for paper, paperboard, and deinked market pulp mills;
- American Plastics Council – Database provided employment and throughput data for plastics reclaimers;
- Steel Recycling Institute – Expert opinion on the steel recycling process and percentage of activities to include in the study; and
- U.S. Geological Survey – Expert opinions on the recycling of nonferrous metals and the percentage of activities to include in the study for nonferrous product producers and nonferrous foundries.

### 3.2.2 SURVEY DATA

When little or no existing data was available for a particular business category, but lists of establishments in those categories were available, R.W. Beck conducted surveys of those businesses and performed a statistical analysis of the results to develop estimates of economic activity.

#### 3.2.2.1 RECYCLING ECONOMIC INFORMATION STUDY DATABASE

R. W. Beck developed a database of Illinois establishments as a tool for surveying businesses in categories with little or no sources of existing economic data. The database was compiled from various electronic databases, recycling directories, periodicals, and other sources. Although the database contains some recycling and reuse industry establishments that are not in survey categories, those listings are incidental incorporations from electronic directories. Please refer to Table 3-1 for a listing of the survey categories for which the database was developed. Once the survey database was finalized, 543 establishments were listed as being in survey categories or as “unknown,” meaning that their appropriate categorization was not known.

#### 3.2.2.2 SURVEY DESIGN

The survey was designed to obtain economic information from businesses in categories with little or no existing information. Appendix D contains a copy of the survey forms that were used for this study.

The survey cover page confirmed the database records for company name, mailing information, physical location, and contact person. For companies with more than one physical location, one cover page and survey for each physical location were completed.

The survey solicited responses to the following questions:

1. Classify the establishment according to the categories defined for the study (respondents could check more than one category);
2. Identify the single category that is most representative of the recycling or reuse-related operations for the establishment;
3. Give estimations of establishment size including number of employees, total annual payroll, and total annual receipts;
4. Estimate the percentages of labor and receipts based on covered recycling activities; and
5. Estimate the amounts, by type, of recycled materials processed.

Checkboxes with associated ranges (i.e., 0-9 employees, \$50,000-\$149,999 total payroll) were used for questions regarding number of employees, payroll, receipts, and percentages.

Due to the sensitive nature of the survey questions, it was anticipated that asking for responses in ranges rather than exact numbers would increase the response rate. With enough responses, any variation from the exact amount was likely averaged out.

### **3.2.2.3 SURVEY APPROACH**

All establishments in the database that were in survey categories (or whose categorization was not known) were mailed a survey. Furthermore, at least three follow-up telephone attempts were made to establishments that failed to respond to the mailed survey in order to obtain survey information.

Once surveys were completed, senior staff reviewed all survey data for accuracy and completeness. Responses were then entered into the REI Study database. After checking the database for errors, the raw data was compiled and analyzed using a statistical approach.

### **3.2.2.4 SURVEY CALCULATIONS**

A statistical analysis of the survey data provided by establishments that completed surveys was used to identify the recycling characteristics of the average establishment in each of the twelve survey business categories. These averages were then applied to all establishments in each survey category to estimate the number of employees<sup>11</sup> involved in recycling activities, as well as the dollar value of recycling and reuse payroll and receipts. However, before making this extrapolation the list of non-responding establishments was examined to identify any establishments that were known to be very large, and whose economic activity would need to be estimated by some other means.

During the survey process 138 establishments confirmed they were in survey categories in the state of Illinois and provided data. This data formed the basis of the statistical analysis. Because many of the establishments initially included in the database were found to have been misclassified or gone out of business, it was necessary to re-estimate the number of establishments in each survey category before extrapolating average statistical data. Of the remaining Illinois establishments on the original contact list, 116 are likely to be in survey categories. Therefore, in Illinois, 254 establishments are believed to be involved in recycling activities in the twelve survey categories. For a detailed explanation of the statistical analysis of surveys, please refer to Appendix E.

### **3.2.3 DERIVATION DATA**

In the third strategy, derivations were made by using data from a variety of sources, such as trade organizations, industry experts, periodicals and other publications. Data points from various sources were pieced together to develop estimates of economic activity. As an example of this approach, a detailed explanation of the sources and methodology used for both public and private curbside collection of recyclables is given in Section 4.2, note 6 of Table 4-2. Additionally, direct data for three of the four support business categories were derived as a result of economic modeling.

## **3.3 INTERMEDIATE INPUT DATA FOR ECONOMIC MODELING**

Prior to beginning economic modeling, the 26 direct recycling and reuse business categories were evaluated to identify those categories where recycling establishments were thought to significantly differ from similar non-recycling establishments in the way they operate, their process inputs, and their purchases from other establishments in the economy. Next, existing

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<sup>11</sup> Employee responses were adjusted to a full-time equivalent basis. Thus, two employees each working 50% on recycling activities would be counted as one recycling employee.

in-house data from previous studies was examined to identify where recycling and reuse industry-specific data was lacking.

For those categories lacking adequate input data, a detailed survey that asked for much greater detail regarding the cost elements of production was sent to select establishments. Those establishments that were cooperative and expressed interest in the study during the gathering of the direct economic information (employment, payroll, and revenues) were targeted for the additional surveys. Only a handful of establishments were targeted for each business category because the major process inputs and cost elements of the businesses were assumed to be very similar to each other (and quite different from the cost elements of virgin business establishments).

### 3.4 ECONOMIC MODELING

This study modeled indirect, induced, and total economic values of 26 categories of recycling or reuse establishments using the IMPLAN<sup>12</sup> economic model.

Economic modeling started with the purchase of data files that provided a standard inter-industrial accounting of the Illinois economy. These data files were procured from Minnesota IMPLAN Group, Inc., the data supplier for the IMPLAN model. What followed was an eight-step process to construct a model that would isolate the 26 categories of recycling and reuse establishments from other establishments in the state so that their economic values could be separately analyzed and reported.

The eight-step process is described below:

1. U.S. standard industrial classifications were identified that best corresponded to the kind of recycling product, process, or service that each of the 26 recycling and reuse categories produces. This was necessary because there is no specific set of "recycling and reuse" industries in the 537 industries contained in the data files.
2. These industrial types were controlled for in the initial model while the remaining industries were aggregated to the one-digit SIC level. The initial model that was produced, then, had twenty-six specific recycling industry candidates and twelve broad industrial aggregates (e.g., farming, the remainders of manufacturing, wholesale trade, transportation, etc.).
3. The direct values obtained from the study were substituted for the direct values (also called the "social" accounts) in the model. Estimates of returns to proprietors, property income, and indirect tax payments to state and local governments were derived from the averages of the original industrial group. This assumed that the recycling or reuse firms yield roughly the same return on investment to sole proprietors or investors as the corresponding industry that may contain significant non-recycling establishments.
4. The remaining values in the parent category (the original values minus the recycling industry direct values) were then manually placed back into the one-digit industrial sector so that the only direct data in the sector reflected the recycling and reuse industries. This ensured the model's total amount of industrial activity summed to precisely the same value as it had originally, before isolating recycling and reuse business categories.
5. Recycling and reuse establishments differ from non-recycling and reuse establishments in the way they operate, their process inputs, and their purchases from other establishments

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<sup>12</sup> The modeling system used for this study is called IMPLAN Pro, published by the Minnesota IMPLAN Group, Inc. Data are available and may be purchased from this company for all states and all counties in the U.S. Their data standards are rigorous, their data sets are updated annually, and their methods for compiling and processing the main input-output data sets are widely considered to be a significant enhancement of the basic I-O data that are compiled and solicited by the U.S. Bureau of Economic Analysis. This company has the largest user base of any of the commercial input-output models available in the U.S.

in the economy. This step attempted to account for these differences with data from two sources: (1) the additional intermediate input data that was collected as described previously; and (2) “in-house” data from other previous county-level studies that were conducted in Iowa, Illinois, Nebraska, and Wisconsin counties that reflected the kinds of recycling industries measured in this study but did not contain virgin-only establishments. Twelve models were built from in-house data from counties to isolate recycling industries (primarily ferrous and nonferrous metals, plastics manufacturing, and paper industries) and their production characteristics. The production inputs in the model were then re-configured so that the industrial linkages to raw commodities, mining, or refiners were reduced and linkages to recycling-related processors were strengthened. These changes resulted in a recalculation of all of the production input values for each recycling and reuse industry category.

6. There are several other components to input-output modeling that were investigated. One modification involved changing regional purchase coefficients (RPCs) in the model. For some materials, recycled commodities may be shipped on average less or greater distances than the virgin alternative, including across state boundaries. In-house data from a previous Recycle Iowa Study (an early economic impact study of recycling) of the general likelihood of a recycled commodity being purchased locally for industrial usage was examined for its bearing on this study. Absent other information about some commodity types, the RPC adjustment for a recycling commodity that was believed to be much more likely purchased locally was estimated by taking the square root of the existing number for that industry. For example, an RPC of 0.31 in a commodity supply category would be inflated to 0.56 to increase the likelihood that the input commodity was purchased locally. RPCs were only changed for a small subset of industries<sup>13</sup> and were only done so to maximize the expected linkage between recovered materials collection, processing, and conversion into final demand goods.

There were other account categories that were assessed also in the INPUT-OUTPUT model. The byproducts category in the model itemizes the commodity production by industry. Each of these categories was scrutinized and assessed as to its reasonableness for each recycling or reuse industry. No other accounts categories were altered in the models (including exports, institutional demands, or household incomes).

7. The resulting model was then re-checked for errors, omissions, and reasonableness and re-estimated in final form. This step included rebalancing the model so that the gross total equaled the original starting values.
8. Once the final state model was constructed, multipliers were generated for each recycling and reuse industry for Total Industrial Output, Personal Income, Value Added, and Jobs. These multipliers were applied to the original direct values to isolate each industry's unique economic contribution.

In order to estimate government revenues associated with the economic data (direct as well as indirect and induced), data on Illinois government finances were gathered for 1992 through 1997 from the U.S. Census of Governments publications. Data on incomes were obtained from the U.S. Bureau of Economic Analysis Regional Economic Information System. Annual incomes were converted to fiscal values, and the weighted average revenue incidences for state government own-source revenues<sup>14</sup> was compiled for:

- All State Taxes (e.g., personal, corporate, sales, use, excise, etc.);

<sup>13</sup> RPCs were increased for the following categories: compost and miscellaneous organics producers, plastics reclaimers, motor vehicle parts (used), and wood reuse.

<sup>14</sup> “Own-source” means collected through the state revenue system and not received, for example, as a state disbursement of funds collected through the federal revenue system.



- Charges and Fees (e.g., direct state charges and fees, including higher education and health);
- Miscellaneous Revenues (e.g., special revenues, gifts, interest earnings, etc.); and
- Total Own-Source Revenues (i.e., the sum of the previous three items).

Local government (including counties, municipalities, school districts, and other special districts) revenue indices were calculated in a similar manner for local own-source taxes and fees. The revenue indices that were developed were then applied to the direct and total values of industrial output and personal income to yield state and local government revenue estimates.

### 3.5 VALIDATION OF STUDY RESULTS

Upon completion of study results for the existing Illinois recycling and reuse industry, various methods of internal and external review were used to ensure that both direct and indirect study results were valid and meaningful. The methods of internal review included:

- Review of completed surveys by senior staff; and
- Comparisons of per-establishment and per-employee figures from Illinois to similar figures from other state and regional studies.

External review included a review of the direct economic information for the 26 recycling and reuse categories by the DCCA. Furthermore, previous reviews by state government staff and industry trade associations of the Northeast data produced by the NERC REI Study and the other state studies validated that the study methodology fairly characterized the level of economic activity for their state or industry.<sup>15</sup>

### 3.6 INDUSTRY GROWTH SCENARIO PROJECTIONS

The final remaining tasks included projections of the economic impact of three recycling growth scenarios. The process for producing these projections included the following steps:

1. The effectiveness of specific policy and program options in achieving recycling objectives and increasing statewide recycling rates was researched;
2. A particular set of policy and program options to achieve each growth scenario was selected;
3. The ability of Illinois' current industry to collect, process, or utilize the additional recovered materials in manufacturing operations was evaluated, considering whether Illinois is a net importer or exporter of grades of recovered materials;
4. Growth projections were made for each of the 26 business categories by applying per-establishment and per-ton data from the existing industry to projected throughput increases – consideration was given to whether manufacturing growth would likely occur or whether feedstock substitution (with no net job increases) would occur;
5. Offsetting declines in economic activity in other industrial sectors (such as landfilling) were then identified so that net economic impacts were known; and
6. Illinois-specific indirect, induced, and tax revenue impacts were projected for each growth scenario based on the modeling and tax revenue data that were previously developed.

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<sup>15</sup> Trade associations that reviewed the NERC study included the American Forest & Paper Association, the American Plastics Council, the Institute of Scrap Recycling Industries, and the Steel Recycling Institute.

This section presents the detailed results and explanations of estimates for individual data points. The section contains:

- A general description of the format for the U.S. Recycling and Reuse Industry data table;
- The U.S. Recycling and Reuse Industry data table of results, including numbered notes that correspond to specific data points in the table and explain how the data was derived;
- An analysis of the results; and
- A discussion of the accuracy and completeness of the results.

#### 4.1 GENERAL NOTES ON DATA TABLES

This section provides general information regarding the format of the U.S. Recycling and Reuse Industry data table presented in this section. Detailed descriptions of all table column headings and an explanation of the three tiers of data presented are given here.

##### 4.1.1 THREE-TIERED APPROACH TO DATA PRESENTATION

Three facts about recycling and reuse businesses complicate recycling economic information studies and have led to inconsistency in past efforts:

- Most establishments involved in recycling and reuse are part of industries in which many establishments do not recycle or reuse recovered materials or products at all;
- Some establishments involved in recycling or reuse are also involved in non-recycling activities not intended to be covered in this study; and
- Many recycling manufacturers use less than 100 percent recycled feedstock and/or adjust the percentage of recycled feedstock throughout the year.

Past studies have handled each of these challenges differently. In an effort to exclude non-recycling activities, some studies relied on survey respondents to estimate recycling activities. Other studies have targeted all facilities involved in recycling and did not attempt to adjust the statistics to account for non-recycling activities. Various industry and recycling experts have criticized both approaches.

To overcome these challenges, the Illinois REI Study is reporting three tiers of statistics. The goals of this approach are:

- To report statistics on recycling and reuse-related businesses as they actually exist in the economy (i.e., as part of industries and establishments that do not always involve recycling); and
- To derive conservative estimates for the amount of economic activity that can "reasonably" be attributed exclusively to recycling. The three tiers of statistics are described below.

##### 4.1.1.1 TIER ONE - STATISTICS ON ALL INDUSTRY ESTABLISHMENTS

Tier One statistics are reported only for certain business categories where data was available from a source that included all establishments in the category, even though some of them may not do any recycling. This information typically comes from U.S. Bureau of Census data by

NAICS code. For example, data for all paper mills will be shown even though some of those establishments do not utilize recovered paper.

### 4.1.1.2 TIER TWO - STATISTICS ON ESTABLISHMENTS INVOLVED IN RECYCLING

Like Tier One, Tier Two statistics are only reported for certain business categories where data was available from a source that aggregated data for recycling and non-recycling establishments. The data covers only those establishments that have some involvement in recycling, and attempts to exclude data on establishments with no recycling activities. Although all of these establishments perform some amount of recycling or reuse activity, they may also perform non-recycling activities not covered in this report. For example, information on all paper mills that utilize recovered paper would be included here, even though some of these establishments may also be involved in non-covered activities like production of wood pulp.

### 4.1.1.3 TIER THREE - STATISTICS ON COVERED RECYCLING ACTIVITIES

Tier Three statistics are the heart of this study and are reported for all business categories. They are conservative estimates of the portion of economic activity in Tier One or Tier Two that can be reasonably attributed to the recycling activities covered in the study. Most Tier Three estimates are derived from survey results in which respondents themselves are asked to identify what percentage of their facility's activities involves "covered activities."<sup>16</sup> For some important categories, including paper, plastics and metals manufacturers, an algorithm is being used to estimate covered economic activity. The algorithms begin with Tier One and Tier Two data as described above. Then, the percentage of Tier Two activity involving covered recycling activities is being estimated based on available statistics and industry expert opinions. The exact approach used for each category is documented in detail in Section 4.3. Additionally, Tier Three statistics are reported in two columns, depending on whether the establishments in the category are "100 percent dependent on recycling," or simply "undertaking recycling activities." Those establishments that are dependent on recycling have 100 percent of employment and revenues derived from recycling activities, while those that are "undertaking recycling activities" have only a portion of economic activity derived from recycling. This distinction is intended to assist in accurately and conservatively reporting overall results and to further illuminate the actual structure of the recycling industry.

## 4.1.2 DEFINITIONS OF COLUMN HEADINGS IN THE DATA TABLES

For Table 4-2, the lettered column headings are defined as follows:

- A. Business Category – for a detailed list of business category definitions, refer to Appendix A.
- B. Data Type – the data types presented in Table 4-2 are:
  - Establishments – an establishment is a single physical location of a company or government. A single company or government may have multiple establishments (physical locations).
  - Employment – total number of employees for all establishments in a category.
  - Annual Payroll – total annual payroll for all employees in a category; reported in thousands of dollars.

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<sup>16</sup> For a complete definition of covered activities, refer to Section 2.1 and note 2 on page 4-8.

- Estimated Receipts – total annual estimated receipts for all establishments in a category; reported in thousands of dollars.
  - Estimated Throughput – if possible, total tons of materials processed is estimated; reported in thousands of tons.<sup>17</sup>
- C. Total Statistics on all Industry Establishments – the combined statistics for all establishments in categories without regard to recycling activity.<sup>18</sup>
- D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities – a subset of Column C and reports statistics on only those establishments with some portion of operations in covered recycling activities. Establishments in this column may have all of their operations or only a portion of their operations involved in covered recycling activities. This column excludes any virgin-only establishments that may be shown in Column C.
- E. Statistics on Establishments Undertaking Recycling or Reuse Activities – a subset of Column D and focuses on the employment, payroll, and receipts figures in establishments with less than 100 percent of operations involved in recycling or reuse-related activities. The same establishments are considered in columns D and E. The employment, payroll, and receipts figures are adjusted to eliminate employees who are focused on virgin material preparation, and further discounted for other non-covered activities.
- F. Statistics on Establishments 100% Recycling or Reuse-Dependent – estimates for establishments with 100 percent of operations dependent on recycling or reuse, which in most cases establishments consume no virgin material.<sup>19</sup> This column presents data that is discounted for non-covered activities.
- G. Estimates of Total Recycling-Related Economic Activity – conservative estimates of total recycling or reuse-related economic activity. These estimates were developed by adding Columns E and F.

### 4.1.3 ABBREVIATIONS USED IN DATA TABLES

Table 4-1 presents a list of abbreviations used in the data table.

**TABLE 4-1**  
**ABBREVIATIONS USED IN TABLE OF RESULTS**

Abbreviation	Definition
AF&PA	American Forest & Paper Association
AISE	American Iron and Steel Engineers
APC	American Plastics Council
GPI	Glass Packaging Institute
REI	Recycling Economic Information Study
SPI	Society of the Plastics Industry
SRI	Steel Recycling Institute
USGS	U.S. Geological Survey

<sup>17</sup> Note that subtotals and grand totals for throughput are not shown due to the potential for triple-counting material by adding tons of the same material at three different stages - collection, local processing, and reclamation/manufacturing.

<sup>18</sup> A category may not show data for Column C because: (1) it does not have virgin-only establishments; or (2) virgin-only establishments were excluded from the data collection process.

<sup>19</sup> All domestic steel mills depend on a minimum level of scrap in their processes. Therefore, all steel mill economic activity is included in this column even though some mills use virgin feedstock.

## 4.2 DATA TABLE

**TABLE 4-2**  
**ILLINOIS RECYCLING AND REUSE INDUSTRY ECONOMIC INFORMATION**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS. ALL NUMBERED NOTES ARE FULLY EXPLAINED AT THE END OF THE DATA TABLE.

		Tier 1		Tier 2		Tier 3				
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Establishments Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]		F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]		G. Estimates of Total Recycling-Related Economic Activity (sum of columns E and F)
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
Recycling Industry Economic Activity										
1. Government Staffed Collection	Establishments							204	Derivation; multiple sources [6]	204
	Employment							900		900
	Annual Payroll							31,275		31,275
	Estimated Receipts							63,491		63,491
	Estimated Throughput							274		274
2. Private Staffed Collection	Establishments							270	Derivation; multiple sources [8]	270
	Employment							1,200		1,200
	Annual Payroll							41,700	41,700	
	Estimated Receipts							84,161	84,161	
	Estimated Throughput							3,511	Derived from IL EPA data [9]	3,511
3. Compost and Miscellaneous Organics Producers	Establishments							59	REI Study Database [10]	59
	Employment							325	Results extrapolated based on	325
	Annual Payroll							5,892	Illinois survey statistical mean	5,892
	Estimated Receipts							26,995	(n=26). [11], [12]	26,995
	Estimated Throughput							335	IL EPA data [13]	335
4. Materials Recovery Facilities (MRFs)	Establishments							28	REI Study Database [10]	28
	Employment							691	Results extrapolated based on	691
	Annual Payroll							12,328	Illinois survey statistical mean	12,328
	Estimated Receipts							43,714	(n=11). [11]	43,714
	Estimated Throughput							202	Derivation; multiple sources [14]	202
5. Recyclable Material Wholesalers	Establishments							493	U.S. Census, 1997 Econ. Census	493
	Employment							6,104	NAICS code 421930. [15], [16]	6,104
	Annual Payroll							194,916		194,916
	Estimated Receipts							3,002,687		3,002,687
	Estimated Throughput							3,248	Derivation [17]	3,248
6. Glass Container Manufacturing Plants	Establishments			4	U.S. Census, 1997 Econ. Census	4	From Column D [20]			4
	Employment			1,170	NAICS code 421930. [16], [18]	1,053	Column D adjusted for			1,053
	Annual Payroll			44,186		39,768	non-covered activities. [20]			39,768
	Estimated Receipts			201,014		180,912				180,912
	Estimated Throughput			133	1997 Economic Census [19]	133	From Column D [20]			133
7. Glass Product Producers (other recycled uses)	Establishments					4	REI Study Database [10]			4
	Employment					232	Results extrapolated based on			232
	Annual Payroll					4,953	Ohio survey statistical mean			4,953
	Estimated Receipts					20,055	(n=3). [21]			20,055
	Estimated Throughput					18	Derivation [22]			18
8. Nonferrous Secondary Smelting and Refining Mills	Establishments			19	U.S. Census, 1997 Econ. Census			19	From Column D [25]	19
	Employment			1,162	NAICS codes 331314, 331423, and 331492. [15], [23]			1,104	Column D adjusted for	1,104
	Annual Payroll			47,115				44,759	non-covered activities [25]	44,759
	Estimated Receipts			702,386				667,267		667,267
	Estimated Throughput			160	1997 Economic Census [24]			160	From Column D [25]	160
9. Nonferrous Product Producers	Establishments	23	U.S. Census, 1997 Econ. Census	12	Column C adjusted for	12	From column D [29]			12
	Employment	6,220	NAICS codes 331315, 331316, 331319, and 331421. [15], [26]	3,110	establishments that don't recycle	2,799	Column D adjusted for			2,799
	Annual Payroll	257,546		128,773	[27]	115,896	non-covered activities [29]			115,896
	Estimated Receipts	1,919,116		959,558		863,602				863,602
	Estimated Throughput			231	1997 Economic Census [28]	231	From column D [29]			231

# STUDY RESULTS

		Tier 1		Tier 2		Tier 3		G. Estimates of Total Recycling-Related Economic Activity (sum of columns E and F)		
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Establishments Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]			F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]	
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources	
10. Nonferrous Foundries	Establishments			101	U.S. Census, 1997 Econ. Census	101	From column D [29]			101
	Employment			4,789	NAICS codes 331521, 331524, 331525, 331528. [15], [30]	4,310	Column D adjusted for non-covered activities [29]			4,310
	Annual Payroll			150,946		135,851				135,851
	Estimated Receipts			549,566		494,609				494,609
	Estimated Throughput			33	1997 Economic Census [31]	33	From column D [29]			33
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments			10	U.S. Census, 1997 Econ. Census			10	From Column D [34]	10
	Employment			1,059	NAICS code 3221. [15], [32]			1,006	Column D adjusted for non-covered activities [34]	1,006
	Annual Payroll			49,110				46,655		46,655
	Estimated Receipts			291,096				276,541		276,541
	Estimated Throughput			839	AF&PA data [33]			839	From Column D [34]	839
12. Paper-Based Product Manufacturers	Establishments							7	REI Study Database[10]	7
	Employment							143	Results extrapolated based on Illinois survey statistical mean (n=3). [11]	143
	Annual Payroll							6,294		6,294
	Estimated Receipts							31,469		31,469
	Estimated Throughput							63	R. W. Beck estimate [35]	63
13. Pavement Mix Producers (asphalt and aggregate)	Establishments					1	REI Study Database[10]			1
	Employment					(D)	[36]			(D)
	Annual Payroll					(D)				(D)
	Estimated Receipts					(D)				(D)
	Estimated Throughput					(D)				(D)
14. Plastics Reclaimers	Establishments							38	APC Database [37]	38
	Employment							1,268		1,268
	Annual Payroll							37,351	Derivation -'97 Econ. Census [37]	37,351
	Estimated Receipts							106,816	Derivation - Plastics News [37]	106,816
	Estimated Throughput							198	APC Database [37]	198
15. Plastics Converters	Establishments	905	SPI Economic Report 2000 for NAICS codes 325991 and 3261 plus captive plastics converting [38]	147	Derivation; from SPI data [39]	147	From Column D [41]			147
	Employment	93,600		15,243	Derivation; from SPI data [39]	12,195	Column D adjusted for non-covered activities [41]			12,195
	Annual Payroll	2,876,600		468,475	Derivation; from SPI data [39]	374,780				374,780
	Estimated Receipts	14,921,600		2,430,089	Derivation; from SPI data [39]	1,944,071				1,944,071
	Estimated Throughput			180	APC Database [40]	180	From Column D [41]			180
16. Rubber Product Manufacturers	Establishments					4	REI Study Database[10]			4
	Employment					226	Results extrapolated based on Illinois survey statistical mean (n=2). [11]			226
	Annual Payroll					11,253				11,253
	Estimated Receipts					22,505				22,505
	Estimated Throughput					54	Derivation [42]			54
17. Steel Mills	Establishments	19	U.S. Census, 1997 Econ. Census NAICS Code 331111[43]	9	Column C minus non-integrated mills (NAICS code 3311114) [44]			9	From Column D [46]	9
	Employment	10,903		9,683				9,199	Column D adjusted for non-covered activities [46]	9,199
	Annual Payroll	483,485		428,945				407,498		407,498
	Estimated Receipts	3,583,475		3,097,905				2,943,010		2,943,010
	Estimated Throughput			3,735	Derivation [45]			3,735	From Column D [46]	3,735
18. Iron and Steel Foundries	Establishments			58	U.S. Census, 1997 Econ. Census NAICS code 33151. [15], [47]	58	From Column D [49]			58
	Employment			6,094		5,789	Column D adjusted for non-covered activities D [49]			5,789
	Annual Payroll			211,467		200,894				200,894
	Estimated Receipts			832,591		790,961				790,961
	Estimated Throughput			527	1997 Economic Census [48]	527	From Column D [49]			527
19. Other Recycling Processors/Manufacturers	Establishments					11	REI Study Database [10]			11
	Employment					257	Results extrapolated based on Illinois survey statistical mean (n=3). [11]			257
	Annual Payroll					5,364				5,364
	Estimated Receipts					57,216				57,216
	Estimated Throughput					284	Derivation [50]			284
Recycling Industry Subtotals	Establishments					342		1,137		1,479
	Employment					26,860		21,940		48,800
	Annual Payroll					888,758		828,667		1,717,425
	Estimated Receipts					4,373,933		7,246,151		11,620,084

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		Tier 1		Tier 2		Tier 3		G. Estimates of Total Recycling-Related Economic Activity (sum of columns E and F)	
		C. Total Statistics on All Industry Establishments (not all perform recycling or reuse-related activities) [1]		D. Total Statistics on Establishments Undertaking Some Recycling or Reuse Activities (includes recycling and non-recycling activities) [2],[3]		E. Statistics on Establishments Undertaking Recycling or Reuse Activities (excluding virgin material preparation and downstream conversion activities) [2],[4]			F. Statistics on Establishments 100% Recycling or Reuse-Dependent (No virgin material) [2],[5]
A. Business Category	B. Data Type	Estimates	Sources	Estimates	Sources	Estimates	Sources	Estimates	Sources
Reuse and Remanufacturing Industry Economic Activity									
20. Computer & Electronic Appliance Demanufacturers	Establishments					9	REI Study Database [10]		9
	Employment					232	Results extrapolated based on		232
	Annual Payroll					5,240	Illinois survey statistical mean		5,240
	Estimated Receipts					22,767	(n=4). [11]		22,767
	Estimated Throughput					N/A			N/A
21. Motor Vehicle Parts (used)	Establishments							217	U.S. Census, 1997 Econ. Census
	Employment							2,137	NAICS code 421140; [15], [51]
	Annual Payroll							51,225	
	Estimated Receipts							246,427	
	Estimated Throughput							N/A	
22. Retail Used Merchandise Sales	Establishments							652	U.S. Census, 1997 Econ. Census
	Employment							3,632	NAICS code 453310; [15], [52]
	Annual Payroll							43,117	
	Estimated Receipts							220,524	
	Estimated Throughput							N/A	
23. Tire Retreaders	Establishments							27	U.S. Census, 1997 Econ. Census
	Employment							487	NAICS code 326212; [15], [53]
	Annual Payroll							11,502	
	Estimated Receipts							58,200	
	Estimated Throughput							N/A	
24. Wood Reuse	Establishments					16	REI Study Database [10]		16
	Employment					312	Results extrapolated based on		312
	Annual Payroll					7,147	Illinois survey statistical mean		7,147
	Estimated Receipts					26,058	(n=6). [11]		26,058
	Estimated Throughput					N/A			N/A
25. Materials Exchange Services	Establishments							2	REI Study Database [10]
	Employment							(D)	[35]
	Annual Payroll							(D)	
	Estimated Receipts							(D)	
	Estimated Throughput							N/A	
26. Other Reuse	Establishments					10	REI Study Database [10]		10
	Employment					649	Results extrapolated based on		649
	Annual Payroll					13,981	Illinois survey statistical mean		13,981
	Estimated Receipts					73,124	n=(5). [11]		73,124
	Estimated Throughput					N/A			N/A
Reuse Industry Subtotals		Establishments				35		898	
	Employment					1,193		6,256	
	Annual Payroll					26,368		105,844	
	Estimated Receipts					121,949		525,151	
GRAND TOTALS		Establishments				377		2,035	
Recycling and Reuse/Remanufacturing	Employment					28,053		28,196	
	Annual Payroll					915,126		934,511	
	Estimated Receipts					4,495,881		7,771,302	
					</				

(D) – Data not disclosed due to a limited number of establishments in this category and the need to avoid revealing data that could identify a single business.

1 Statistics for Column C include data for all establishments in industries with recycling or reuse-related activities. Although the industry overall performs recycling or reuse-related activities, it may include some establishments with no recycling or reuse-related activities.

2 Covered activities is defined as all activities that support:

- Transforming pre-consumer materials or post-consumer products into a recycled material;
- Transforming recycled materials into a first intermediate product (e.g. sheet, fiber, roll);
- Transforming recycled materials directly into a finished product;
- Preparing used products for reuse; and
- Manufacturing equipment for the recycling or reuse industries.

Covered activities *do not* include converting a first intermediate product to finished or semi-finished products or preparing materials for fuel use.

3 Statistics are for establishments with some amount of covered recycling activities. Establishments may perform both non-recycling and recycling activities.

4 These estimates include activities where virgin and recycled feedstock materials are co-processed. The estimates do not include virgin-only feedstock material preparation activities and further conversion of intermediate products to finished or semi-finished goods.

5 Statistics on establishments where 100 percent of labor and receipts are dependent on recycling or reuse-related activities. The estimates do not include virgin-only feedstock material preparation activities and further conversion of intermediate products to finished or semi-finished goods.

6 The data for Category 1, Government Staffed Residential Curbside Collection, was derived through an algorithm based on data points from a variety of sources. The following tables summarize calculations and data sources used in making estimates of economic activity for this category.

**Summary of Calculations**

Data Type	Calculation <sup>1</sup>
Establishments	1) $K \cdot D$
Recycling Collection Employees	2) $((A/(B \cdot C \cdot F)) \cdot D \cdot E) \cdot (1+G) \cdot (1+H)$
Yard Waste Collection Employees	3) $((A/(B \cdot L \cdot F)) \cdot D \cdot M \cdot N \cdot O) \cdot (1+G) \cdot (1+H)$
Total Curbside Recycling and Yard Waste Collection Employees	4) Calculation 2+ Calculation 3
Annual Payroll	5) Calculation 4* $I$
Receipts	6) $(A/B) \cdot D \cdot (J+N \cdot P) \cdot 12 \text{ months/year}$

<sup>1</sup>Variables are defined in the following table.



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**Summary of Data Sources Used for  
Government Staffed Residential Curbside Collection**

<b>Data Label</b>	<b>Data Type</b>	<b>Value</b>	<b>Reference</b>
<b>A</b>	Population with curbside collection	8,051,000	BioCycle (11/2000)
<b>B</b>	Persons per household	2.65	U.S. Census Bureau
<b>C</b>	Homes collected per truck per day	900	R. W. Beck Estimate
<b>D</b>	Percent of homes collected by government staffed collection	43%	R. W. Beck Privatization Study
<b>E</b>	Average crew per truck	1.5	R. W. Beck Estimate
<b>F</b>	Collection days per cycle	5	Assumes once per week collection
<b>G</b>	Additional percent supervisory	10%	R. W. Beck Estimate
<b>H</b>	Additional percent absenteeism, etc.	5%	R. W. Beck Estimate
<b>I</b>	Average payroll per employee	\$34,750	1997 U.S. Economic Census
<b>J</b>	Recycling collection cost per household per month	\$2.15	R. W. Beck Estimate
<b>K</b>	Number of curbside programs	474	BioCycle (11/2000)
<b>Additional Data for Yard Waste Collection</b>			
<b>L</b>	Homes collected per truck per day	1,000	R. W. Beck Estimate
<b>M</b>	Average crew per truck	2	R. W. Beck Estimate
<b>N</b>	Percent of households with yard waste collection	100%	Estimated from BioCycle (11/2000)
<b>O</b>	Percent of year collection takes place	66%	R. W. Beck Estimate
<b>P</b>	Yard Waste Collection Cost per Household per Month	\$1.90	R. W. Beck Estimate

7 Throughput is estimated based on per-employee collection averages from Ohio due to the unavailability of Illinois data.

8 Calculations and values for Private Staffed Residential Curbside Collection are the same as those presented in Note 6, with the exception of Data Label D. For Category 2, Data Label D is "Percent of Homes Collected by Private Sector."

9 Throughput is from the Illinois EPA publication *Nonhazardous Solid Waste Management and Landfill Capacity in Illinois, 1998 Annual Report* minus throughput by government staffed curbside collection.

10 Number of establishments for all survey categories is based on the REI study database.

11 Unless noted otherwise, number of employees, payroll, and receipts for all survey categories is based on a statistical analysis of Illinois survey results. See Section 3.2.2 for a detailed description of survey design and calculations. The number of completed surveys on which results are based is given as “n.”

12 Number of employees, payroll, and receipts for Compost and Organics Producers are based on a statistical analysis of survey results. Surveys focused on active processing of organic materials for beneficial use. As a result, number of establishments and potential economic activity associated with inactive composting techniques (i.e., allowing materials to slowly and independently decompose over time) may not be fully reflected in totals.

13 Throughput is from the Illinois EPA publication *Nonhazardous Solid Waste Management and Landfill Capacity in Illinois, 1998 Annual Report*.

14 Throughput is derived by multiplying an estimate for curbside tons by an estimate for the percentage of material collected that is processed by MRF's.

15 Data obtained from the U.S. Census, 1997 Economic Census. See Section 3.2.1.2 for a detailed description of the use of Census Bureau statistics.

16 Data are taken directly from U.S. Census, 1997 Economic Census for NAICS code 421930 – Recyclable Material Wholesalers. This category includes a number of different types of businesses including scrap metal and plastics dealers, C&D processors, beneficiation facilities, crumb rubber producers and textile processors. No adjustments were made to Census data since the category is defined as 100 percent recycling-related.

17 Throughput for Recyclable Material Wholesalers is derived as follows:

Government Staffed Collection Throughput + Private Staffed Collection Throughput – Compost/Organics Throughput – Materials Recovery Facilities Throughput.

18 The 1997 Economic Census figures included five glass container manufacturing establishments. Subsequent to the Census, one establishment was closed. Census figures have therefore been reduced by 20 percent due to the plant closure.

19 Throughput is estimated based on 1997 Economic Census reports showing a national average of 114 tons of cullet per employee multiplied by the number of Illinois employees.

20 Number of establishments and throughput are taken from Column D with no adjustments. Employment, annual payroll, and estimated receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent).

21 Number of employees, payroll, and receipts for Glass Product Producers are based on a statistical analysis of survey results for Ohio. Those statistics were used because no Illinois establishments provided survey data.

22 Throughput is estimated as 76 tons per employee based on an average of survey responses from the Northeast, Florida, Indiana, Ohio, Nebraska, and Illinois and Glass Packaging Institute secondary glass use data of 614,000 tons per year nationally.

23 Data for Nonferrous Smelting and Refining Mills is taken from the 1997 Economic Census for NAICS codes 331314, 331423, and 331492.

24 Throughput for nonferrous smelting and refining is estimated based on national scrap consumption for smelting and refining mills from the 1997 Economic Census and information from the USGS' publication *Minerals Information – 1997, Recycling – Metals*. Allocation to the state level is based on a ratio of state employment to national employment for this industry.

25 Employment, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (95 percent). Number of establishments and throughput are from Column D with no adjustment.

26 Data for Nonferrous Product Producers is taken from the 1997 Economic Census for NAICS codes 331315, 331316, 331319, and 331421 with no adjustments.

27 Data are derived by multiplying Column C figures by 50 percent, the percentage of establishments assumed to be utilizing scrap or recycled materials, based on comments from U.S.G.S. nonferrous metals specialists.

28 Throughput for Nonferrous Product Producers is estimated based on nationwide scrap purchases for this industry as reported in the 1997 Economic Census. Allocation to the state level is based on a ratio of state employment to national employment for this industry.

29 Estimates of employees, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (90 percent). Number of establishments and throughput are from Column D with no adjustments.

30 Data for Nonferrous Foundries is taken from the 1997 Economic Census for NAICS codes 331521, 331524, 331525, and 331528, with no adjustments.

31 Throughput for Nonferrous Foundries is estimated based on scrap purchases reported in the 1997 Economic Census. Total tons of scrap for the U.S. is calculated as:

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Total Scrap Cost (by NAICS code) / (\$0.45/lb for aluminum or \$0.72/lb. for copper) / (2,000 lbs/ton).

Tons of scrap on a state-level is estimated as:

Total tons x State Employees/U.S. Employees.

32 Data for Paper, Paperboard, and Deinked Market Pulp Mills is taken from the 1997 Economic Census for NAICS code 3221 with no adjustments.

33 Throughput is taken from the AF&PA *Annual Statistical Summary Recovered Paper Utilization* (April, 1999). Throughput numbers used are for 1997 to coincide with the data from the 1997 Economic Census.

34 Estimates of employees, payroll, and receipts are derived from Column D with an adjustment for the percent of covered activities (95 percent). Number of establishments and throughput are from Column D with no adjustments. AF&PA's *Paper Matcher* and Lockwood Post's *Directory of the Pulp, Paper, and Allied Trades* revealed that all Illinois paper mills depend on recovered paper.

35 Throughput is estimated by multiplying employees times a tons per employee figure (277) derived from an average of survey responses from the U.S. Recycling Economic Information Study.

36 (D) indicates that figures cannot be reported in order to avoid disclosure of individual company information.

37 For Plastics Reclaimers, establishments, employees, and throughput are based on the American Plastics Council Handler & Reclaimer database developed by R.W. Beck. Payroll is calculated by multiplying employment figures by Census Bureau's 1997 average wage for Illinois plastics industry employees (\$29,457).

Estimated receipts is calculated by multiplying throughput of recycled resins produced times an average of recycled resin prices from Plastics News. Throughput is derived from per-employee averages from American Plastics Council statistics as compiled by R. W. Beck.

38 Establishments, employees, payroll, and receipts in column C for Plastics Converters are obtained from the Society of the Plastics Industry's *Economic Report 2000* for plastics converters (NAICS codes 325991 and 3261) plus additional estimates for captive plastics converting operations by establishments classified in other non-plastics industries.

39 Number of establishments, employees, payroll, and estimated receipts in Column D are derived by multiplying column C figures by the industry-wide recycled-content percentage (5.7 percent) divided by the average recycled content of products that contain recycled materials (35 percent).

40 Throughput is calculated from the state's percentage of national plastics converter employees multiplied by the total tons of plastics recycled nationally (APC Plastics Recycling Rate Study as compiled by R. W. Beck, with additions for pre-consumer plastics recycled).

41 Number of establishments and throughput are directly from Column D. Employees, payroll, and receipts are derived from Column D by multiplying by the estimated percent of employees at recycling-related establishments that are involved in covered recycling-related activities (80 percent).

42 Throughput is estimated by multiplying employees times a tons per employee figure (240) derived from an average of survey responses from the U.S. Recycling Economic Information Study.

43 Data for Steel Mills comes from the 1997 Economic Census for NAICS code 331111 with no adjustments.

44 Establishments, employees, payroll, and revenue figures are derived from Column C by excluding non-integrated mills (NAICS 3311114), which do not make steel.

45 Throughput is calculated as state's percentage of national steel mill employees multiplied by the total tons of steel scrap consumed (1997 Economic Census) by steel mills nationally.

46 Employment, payroll, and receipts are equal to estimates from Column D multiplied by 95 percent (5 percent deduction to account for downstream conversion). Based on comments from SRI, 100 percent of steel mills are dependent on recovered steel to make new steel, utilizing anywhere from 15 percent-100 percent recovered steel. Therefore, the only deduction taken is to account for non-covered activities. Establishments and throughput are from Column D with no adjustment.

47 For Iron and Steel Foundries, estimates for column D are taken directly from U.S. Census SSEL with no adjustments. SRI states that all foundries as a matter of practice utilize a significant percentage of scrap in the making of new iron products.

48 Throughput for Iron and Steel Foundries is estimated as the state's percentage of total national foundry employees multiplied by national scrap consumption by foundries (1997 Economic Census).

49 In Column E, establishments and throughput are taken directly from Column D. Employees, payroll, and receipts from Column D are multiplied by 95 percent, the estimated percent of foundry employees involved in covered recycling-related activities.

50 Throughput is estimated by multiplying employees times a tons per employee figure (1,105) derived from an average of survey responses from the U.S. Recycling Economic Information Study.

51 The 1997 Economic Census only reported number of establishments for Motor Vehicle Parts to avoid disclosing individual company information. Estimates for employment, payroll, and receipts are derived from Illinois per-establishment average data from the U.S. Census' 1996 Standard Statistical Establishments List for SIC code 5015 (Motor Vehicle Parts) times the number of establishments from the 1997 Economic Census for NAICS code 421140.

52 Estimates for Retail Used Merchandise Sales are taken directly from the 1997 Economic Census for NAICS code 453310 with no adjustments.

53 Estimates for Tire Retreaders are taken directly from the 1997 Economic Census for NAICS code 326212 with no adjustments.

### 4.3 ANALYSIS OF RESULTS

Table 4-3 presents an analysis of three data types related to the results presented in Table 4-2. The three analyses performed for each category and sector (recycling and reuse) were:

- The number of establishments, employees, payroll, and receipts as a percentage of the total for all categories;
- Number of employees per establishment; and,
- Average annual payroll per employee.

**TABLE 4-3**  
**ANALYSIS OF ECONOMIC ACTIVITY FOR THE RECYCLING AND REUSE INDUSTRY**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Business Category	Data Type	Estimates of Recycling and Reuse-Related Economic Activity	Percent of Total for All Categories	Employees per Establishment	Annual Payroll per Employee	Estimated Receipts per Employee
<b>Recycling Industry Economic Activity</b>						
1. Government Staffed Residential Curbside Collection	Establishments	204	8.5%			
	Employment	900	1.6%	4		
	Annual Payroll	31,275	1.7%		35	
	Estimated Receipts	63,491	0.5%			71
2. Private Staffed Residential Curbside Collection	Establishments	270	11.2%			
	Employment	1,200	2.1%	4		
	Annual Payroll	41,700	2.3%		35	
	Estimated Receipts	84,161	0.7%			70
3. Compost and Miscellaneous Organics Producers	Establishments	59	2.4%			
	Employment	325	0.6%	6		
	Annual Payroll	5,892	0.3%		18	
	Estimated Receipts	26,995	0.2%			83
4. Materials Recovery Facilities (MRFs)	Establishments	28	1.2%			
	Employment	691	1.2%	25		
	Annual Payroll	12,328	0.7%		18	
	Estimated Receipts	43,714	0.4%			63
5. Recyclable Material Wholesalers	Establishments	493	20.4%			
	Employment	6,104	10.9%	12		
	Annual Payroll	194,916	10.5%		32	
	Estimated Receipts	3,002,687	24.5%			492
6. Glass Container Manufacturing Plants	Establishments	4	0.2%			
	Employment	1,053	1.9%	263		
	Annual Payroll	39,768	2.2%		38	
	Estimated Receipts	180,912	1.5%			172
7. Glass Product Producers (other recycled uses)	Establishments	4	0.2%			
	Employment	232	0.4%	58		
	Annual Payroll	4,953	0.3%		21	
	Estimated Receipts	20,055	0.2%			87
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	19	0.8%			
	Employment	1,104	2.0%	58		
	Annual Payroll	44,759	2.4%		41	
	Estimated Receipts	667,267	5.4%			604
9. Nonferrous Product Producers	Establishments	12	0.5%			
	Employment	2,799	5.0%	243		
	Annual Payroll	115,896	6.3%		41	
	Estimated Receipts	863,602	7.0%			309
10. Nonferrous Foundries	Establishments	101	4.2%			
	Employment	4,310	7.7%	43		
	Annual Payroll	135,851	7.3%		32	
	Estimated Receipts	494,609	4.0%			115
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	10	0.4%			
	Employment	1,006	1.8%	101		
	Annual Payroll	46,655	2.5%		46	
	Estimated Receipts	276,541	2.3%			275
12. Paper-based Product Manufacturers	Establishments	7	0.3%			
	Employment	143	0.3%	20		
	Annual Payroll	6,294	0.3%		44	
	Estimated Receipts	31,469	0.3%			220
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	1	<0.1%			
	Employment	(D)	(D)	(D)		
	Annual Payroll	(D)	(D)		(D)	
	Estimated Receipts	(D)	(D)			(D)

Business Category	Data Type	Estimates of Recycling and Reuse-Related Economic Activity	Percent of Total for All Categories	Employees per Establishment	Annual Payroll per Employee	Estimated Receipts per Employee
14. Plastics Reclaimers	Establishments	38	1.6%			
	Employment	1,268	2.3%	33		
	Annual Payroll	37,351	2.0%		29	
	Estimated Receipts	106,816	0.9%			84
15. Plastics Converters	Establishments	147	6.1%			
	Employment	12,195	21.7%	83		
	Annual Payroll	374,780	20.3%		31	
	Estimated Receipts	1,944,071	15.8%			159
16. Rubber Product Manufacturers	Establishments	4	0.2%			
	Employment	226	0.4%	57		
	Annual Payroll	11,253	0.6%		50	
	Estimated Receipts	22,505	0.2%			100
17. Steel Mills	Establishments	9	0.4%			
	Employment	9,199	16.4%	1,022		
	Annual Payroll	407,498	22.0%		44	
	Estimated Receipts	2,943,010	24.0%			320
18. Iron and Steel Foundries	Establishments	58	2.4%			
	Employment	5,789	10.3%	100		
	Annual Payroll	200,894	10.9%		35	
	Estimated Receipts	790,961	6.4%			137
19. Other Recycling Processors/Manufacturers	Establishments	11	0.5%			
	Employment	257	0.5%	23		
	Annual Payroll	5,364	0.3%		21	
	Estimated Receipts	57,216	0.5%			223
Recycling Subtotals	Establishments	1,479	61.3%			
	Employment	48,800	86.8%	33		
	Annual Payroll (\$1,000)	1,717,425	92.9%		35	
	Estimated Receipts (\$1,000)	11,620,084	94.7%			238

Reuse and Remanufacturing Industry Economic Activity						
20. Computer and Electronic Appliance Demanufacturers	Establishments	9	0.4%			
	Employment	232	0.4%	26		
	Annual Payroll	5,240	0.3%		23	
	Estimated Receipts	22,767	0.2%			98
21. Motor Vehicle Parts (used)	Establishments	217	9.0%			
	Employment	2,137	3.8%	10		
	Annual Payroll	51,225	2.8%		24	
	Estimated Receipts	246,427	2.0%			115
22. Retail Used Merchandise Sales	Establishments	652	27.0%			
	Employment	3,632	6.5%	6		
	Annual Payroll	43,117	2.3%		12	
	Estimated Receipts	220,524	1.8%			61
23. Tire Retreaders	Establishments	27	1.1%			
	Employment	487	0.9%	18		
	Annual Payroll	11,502	0.6%		24	
	Estimated Receipts	58,200	0.5%			120
24. Wood Reuse	Establishments	16	0.7%			
	Employment	312	0.6%	20		
	Annual Payroll	7,147	0.4%		23	
	Estimated Receipts	26,058	0.2%			83
25. Materials Exchange Services	Establishments	2	0.1%			
	Employment	(D)	(D)	(D)		
	Annual Payroll	(D)	(D)		(D)	
	Estimated Receipts	(D)	(D)			(D)
26. Other Reuse	Establishments	10	0.4%			
	Employment	649	1.2%	65		
	Annual Payroll	13,981	0.8%		22	
	Estimated Receipts	73,124	0.6%			113
Reuse and Remanufacturing Subtotals	Establishments	933	38.7%			
	Employment	7,449	13.2%	8		
	Annual Payroll (\$1,000)	132,212	7.1%		18	
	Estimated Receipts (\$1,000)	647,100	5.3%			87

GRAND TOTALS	Establishments	2,412	100.0%			
Recycling, Reuse and Remanufacturing	Employment	56,249	100.0%	23		
	Annual Payroll (\$1,000)	1,849,637	100.0%		33	
	Estimated Receipts (\$1,000)	12,267,184	100.0%			218

(D) – Data not disclosed due to a limited number of establishments in this category and the need to avoid revealing data that could identify a single business.

Insight into Illinois' recycling and reuse industry can be obtained by comparing the relative sizes of individual business categories and groups of categories that are related in terms of materials recycled or sector of the industry that they are in. Sector groupings include:

- Recycling
  - Collection;
  - Processing;
  - Manufacturing; and
- Reuse and Remanufacturing.

### 4.3.1 COMPARISON OF INDUSTRY SECTORS

Figures 4-1 and 4-2 compare the relative sizes of the recycling collection, recycling processing, recycling manufacturing, and reuse/remanufacturing sectors of the industry. As Figures 4-1 and 4-2 show, the economic size of the recycling manufacturing sector far exceeds the size of the recycling collection, recycling processing, and reuse sectors.

**FIGURE 4-1**  
**EMPLOYMENT BY INDUSTRY SECTOR**

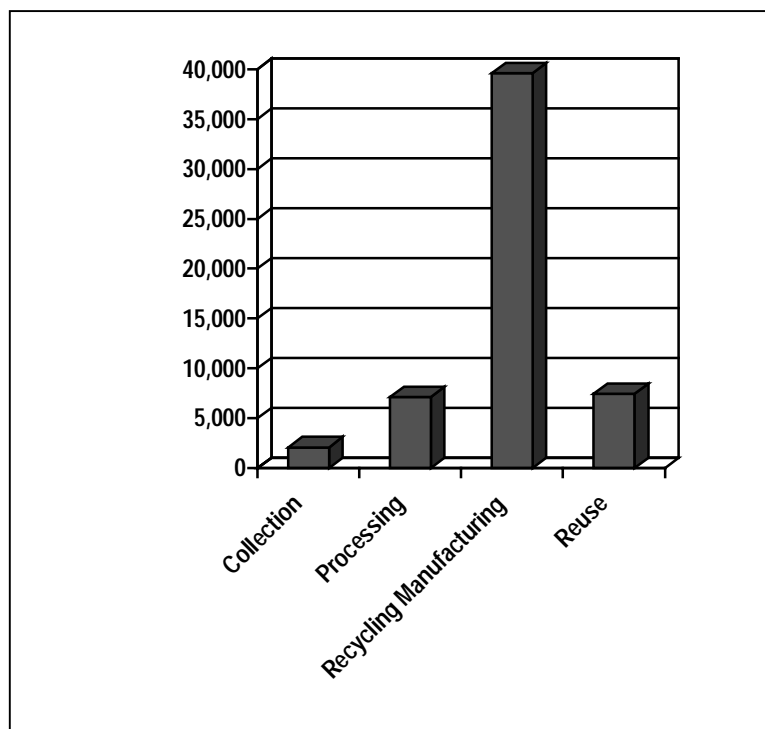
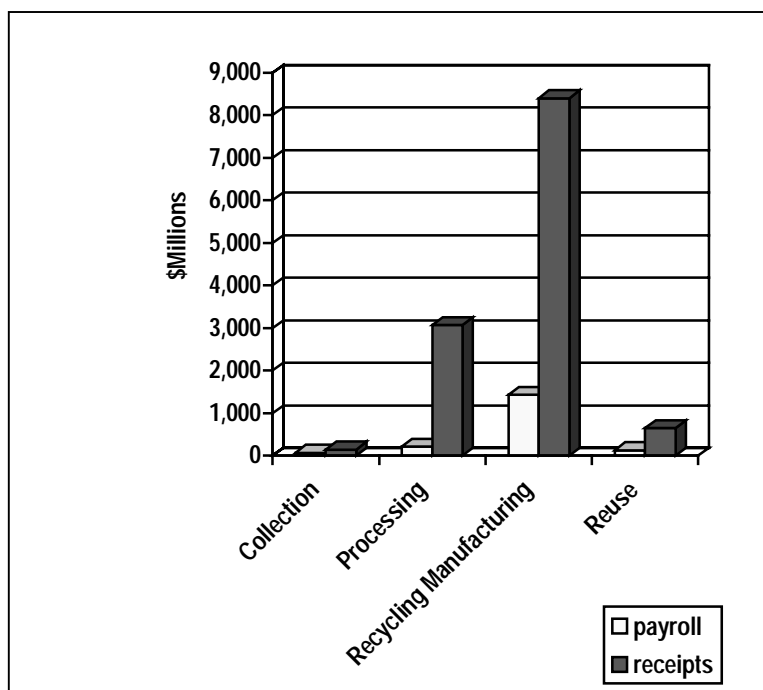


FIGURE 4-2  
PAYROLL AND RECEIPTS BY INDUSTRY SECTOR



The ultimate value of a good or service is represented by the sale price of that good or service. Sales revenues, in turn, are used to employ persons and pay their wages, make payments on equipment, provide a return to owners and investors, and pay upstream supplier establishments for the value of their goods or services. The cost in terms of labor, equipment, etc. of performing a particular process is a measure of the value that is added by that particular process.

The progression in size from recycling collection to recycling processing to recycling manufacturing follows from the fact that those sectors are part of a chain where increasingly more value is added to the recovered material as it moves through the recycling chain. Initially, a relatively small amount of value is added by consolidation (collection). Processors invest significantly more expense (value) in the recovered material by sorting and densification. However, no transformation of the recovered material has yet occurred – the material has simply been concentrated. The greatest value is added in manufacturing where relatively useless raw materials of little value are made into useful products of considerable value.

Reuse and remanufacturing differ slightly in that they focus on consolidation and refurbishing of products (not raw materials) that still have significant value; however, the value reuse adds cannot exceed the value inherent in a new product made from raw materials – otherwise people would buy the new product. This limits the amount of value that can be added, and thus the size of the reuse sector compared to the manufacturing sector. Although the reuse and remanufacturing sector comprises 39 percent of total establishments, it makes up only 13 percent of total employees, 7 percent of payroll, and 5 percent of receipts.<sup>20</sup>

<sup>20</sup> These reuse and remanufacturing figures are thought to represent the minimum amount of economic activity captured by the methodology because remanufacturing activities are often included with traditional manufacturing industries that were not included in this study. Several years ago Boston University estimated remanufacturing activities on the national level (Professor Robert T. Lund, *The Remanufacturing Industry: Hidden Giant*, 1996). That study suggested that reuse and remanufacturing categories may be as much as three times larger than that characterized by this study's methodology.



### 4.3.2 COMPARISON OF RECYCLING COLLECTION AND PROCESSING TO RECYCLING MANUFACTURING

Recycling categories that are focused locally on recovering materials from commercial, industrial, and residential waste streams include establishments that collect and process recyclables for shipment to the recycling manufacturing industry. These local collection and processing establishments include the following categories of establishments:

- Government staffed residential curbside collection;
- Privately-staffed residential curbside collection;
- Compost and miscellaneous organics products producers;
- Materials recovery facilities; and
- Recyclable material wholesalers.

Alternatively, establishments in the recycling manufacturing sector are considered to be downstream consumers of recovered materials who rely on local collectors and processors for their supply of materials. When the two groups are compared, local collection and processing make up 19 percent of total recycling employment, 17 percent of recycling payroll, and 28 percent of receipts, whereas downstream manufacturing makes up the remaining 81 percent of employment, 83 percent of payroll, and 72 percent of receipts. This suggests that public policy to encourage recycling and discourage disposal and public and private investment in local recyclables collection and processing infrastructure pay great dividends in supporting significant downstream private recycling economic activity.

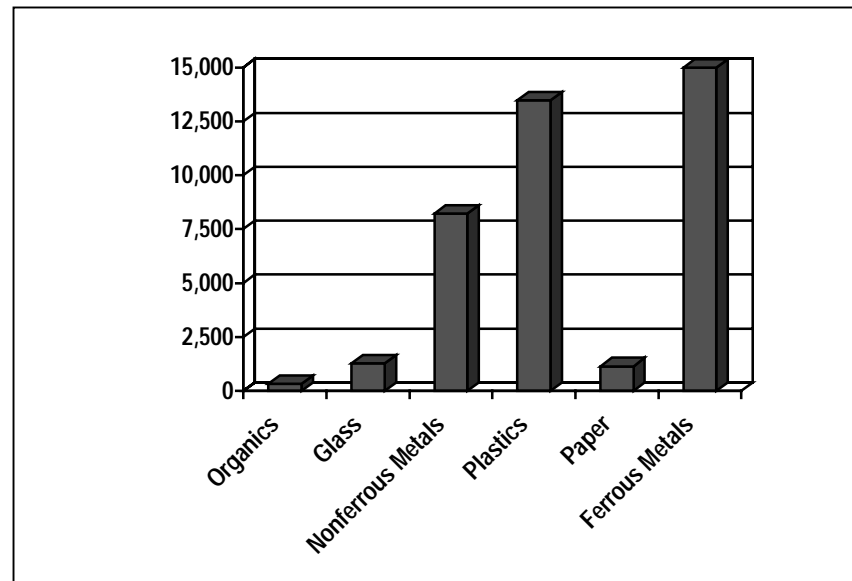
### 4.3.3 LARGEST CONTRIBUTORS

Upon closer examination of Table 4-2, over half of the economic activity for the entire recycling and reuse industry is accounted for by the following four categories of establishments:

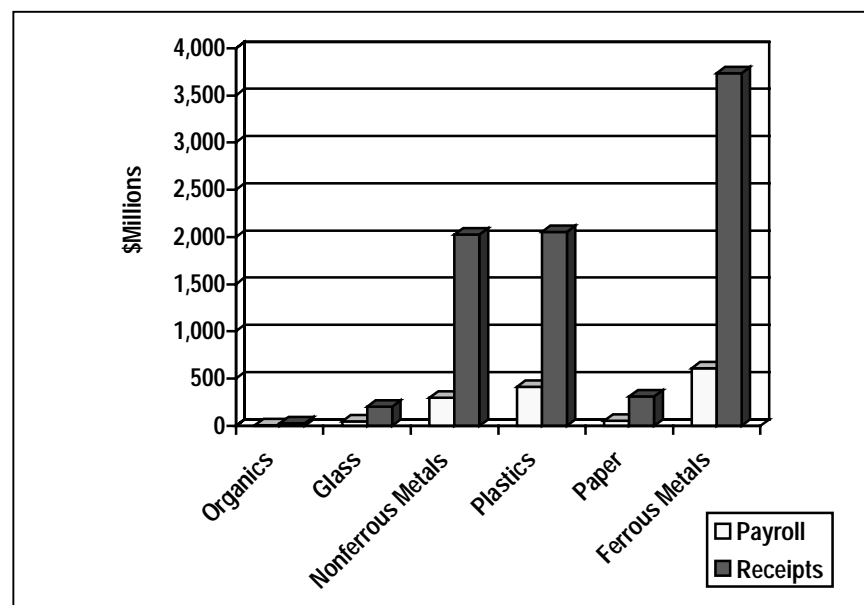
- Plastics converters, which employ 12,195 people and gross \$1.9 billion in annual receipts;
- Steel mills, which employ 9,199 people and gross \$2.9 billion in annual receipts;
- Recyclable material wholesalers, which employ 6,104 people and gross \$3.0 billion in annual receipts; and
- Iron and steel foundries, which employ 5,789 employees and gross \$0.8 billion in annual receipts.

These four categories alone account for 59 percent of all employees, 64 percent of wages, and 71 percent of total receipts. Figures 4-3 and 4-4 place this information into further perspective by showing how the size of Illinois' major recyclable materials manufacturing industries compare to each other. As the figures show, the metals and plastics recycling manufacturing industries contribute predominantly to recycling manufacturing's overall size.

**FIGURE 4-3**  
**RECYCLING MANUFACTURING INDUSTRY EMPLOYMENT BY MAJOR MATERIAL GROUP**



**FIGURE 4-4**  
**RECYCLING MANUFACTURING INDUSTRY PAYROLL AND RECEIPTS BY MAJOR MATERIAL GROUP**



The amount of materials recycled, in combination with the underlying value of each raw material, helps explain why some major material groups shown in Figures 4-3 and 4-4 rank higher than others. When large quantities of a high-value commodity are returned to the stream of commerce, the large amount of intrinsic value returned to the economy can support more jobs and economic activity than if a lesser amount or lower value commodity is returned to the stream of commerce. Plastics and non-ferrous metals are at the top of the value scale, ferrous metals and paper are in the middle, and glass and compost are at the low end of the value scale. Major material group recycling amounts as estimated by this study are:

- Yard waste – 335 thousand tons (recycling of other organic materials is negligible);

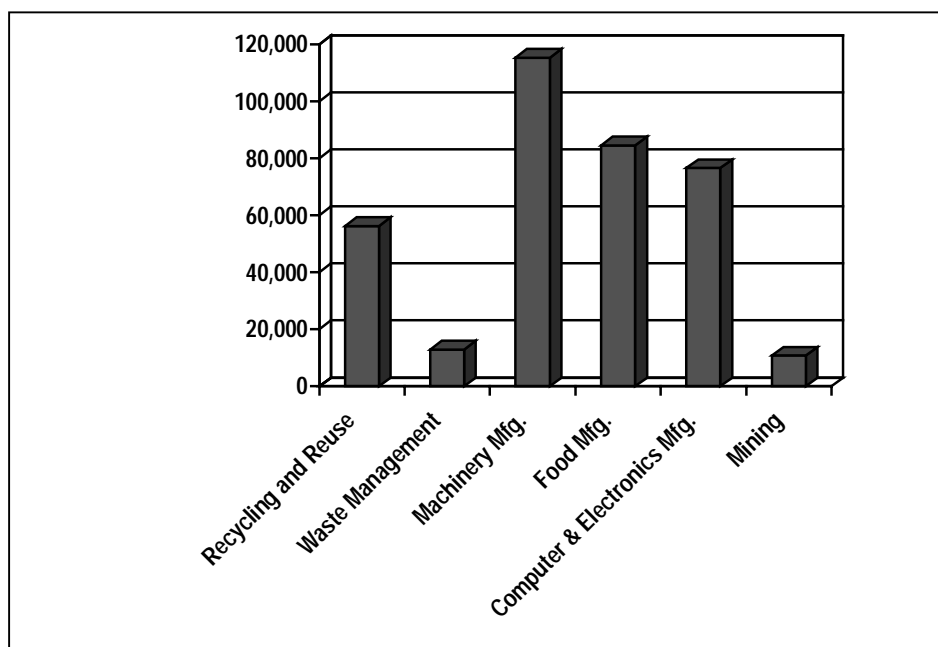
- Glass – 151 thousand tons;
- Nonferrous metals – 424 thousand tons;
- Plastics – 378 thousand tons;
- Paper – 902 thousand tons; and
- Ferrous metals – 4,262 thousand tons.

When both the amount recycled and value are considered together, the relative sizes of the various material groups can be explained. Similarly, estimates can be made of the economic impact that results from increased diversion of the various materials.

### 4.3.4 THE RECYCLING AND REUSE INDUSTRY IN PERSPECTIVE

Figures 4-5, 4-6, and 4-7 show how Illinois' recycling and reuse industry compares to other select state industries.<sup>21</sup> These industries were chosen because they present alternatives to recycling and reuse (i.e., waste management and mining) or because they are considered to be important or preferred industries that are often targeted by economic developers.

**FIGURE 4-5  
COMPARISON OF INDUSTRY EMPLOYMENT**



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<sup>21</sup> Comparative industry information comes from the 1997 Economic Census (U.S. Census Bureau) for the following industries: waste management – NAICS 562 waste management and remediation services minus 56292 materials recovery facilities; machinery manufacturing – NAICS 333; food manufacturing – NAICS 311; computer and electronics manufacturing – NAICS 334; mining – NAICS 21.

FIGURE 4-6  
COMPARISON OF ANNUAL WAGES PER JOB

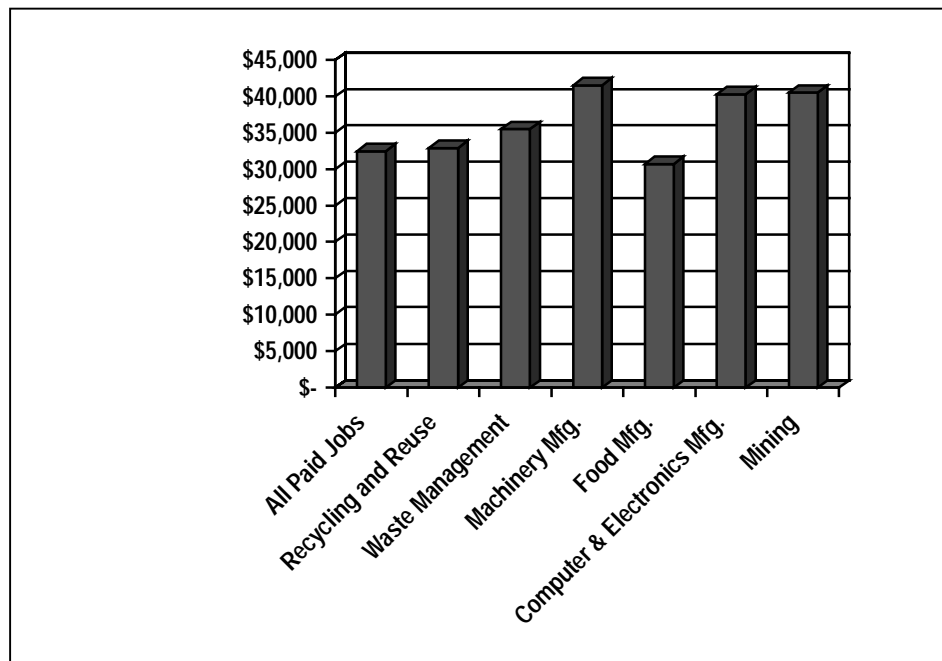
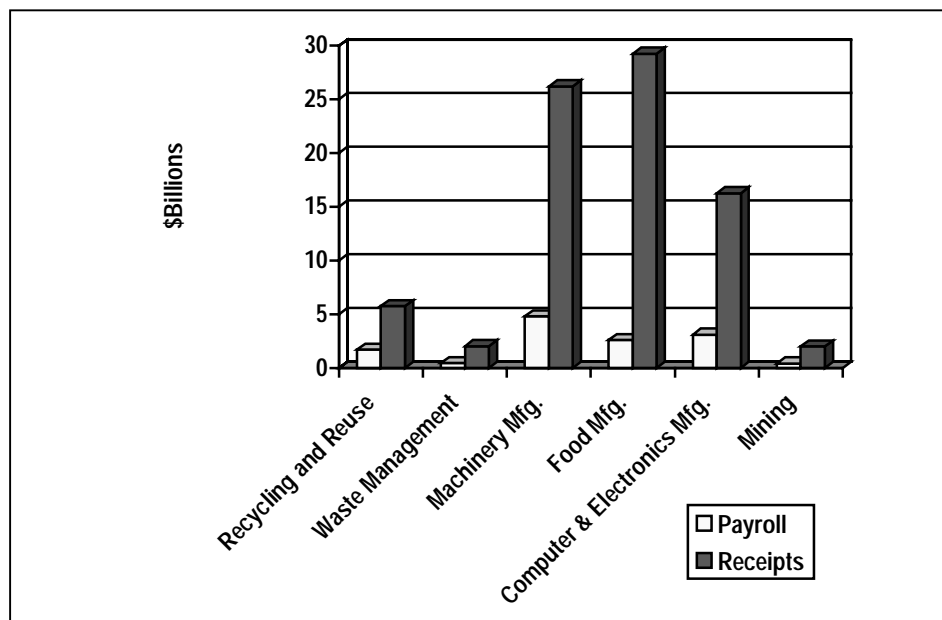


FIGURE 4-7  
COMPARISON OF TOTAL WAGES AND SALES



As the three figures show, the recycling and reuse industry is a significant industry to Illinois, providing jobs that pay slightly more than the state average. Although significantly more discards are disposed rather than recycled, the recycling and reuse industry is larger than the waste management industry.

### 4.4 ACCURACY AND COMPLETENESS OF RESULTS

The results of this study for the categories identified are thought to be realistic and generally conservative. The results for categories which used existing U.S. Census data are believed to be the most accurate, followed by data for survey categories, while the derivations are likely to be the least accurate because of the limited amount of available data for estimations. Census data, although updated yearly, lags in publication by three years so that data is not as current as data for survey categories. Survey data is current; however, confidence intervals for total employment, payroll, and receipts for certain categories are quite large because of the small number of establishments in those categories.

The study did encounter a number of limitations that impacted the ability to accurately capture all recycling and reuse activity. The limitations of the study include:

- Survey forms asked for data in intervals rather than discrete numbers;
- Certain business categories that could be considered part of the recycling and reuse industry were excluded because data was not available. Most notable is equipment remanufacturers, for which only a one-time national-level study was conducted, and for which lists of contact information are not maintained. In other cases, such as repair shops, there is significant debate on the types of repair activities that should be counted (e.g., automobile repair establishments).
- Many establishments in rapidly growing recycling and reuse sectors, or those that were recycling non-traditional materials (such as fluorescent lamps and carpets) may not have been fully listed in recycling directories, and thus their activity may be underrepresented in the overall results.
- Some derivations, such as that for plastics converters, are based on the best of several less-than-desirable options available; it is very difficult to assess the accuracy of those results.

Although the study was not able to capture every possible type of recycling and reuse activity, it is reasonably accurate for the categories shown and conservatively estimates the total amount of recycling and reuse activity taking place.

### 4.5 COMPARISONS TO OTHER STATES

Several states conducted REI studies using the same standardized REI methodology used for this study. Therefore, the results for those states generally can be compared to the totals for Illinois found in this report. The same can be said for the National REI study results.

The overall results for California, Delaware, Florida, Illinois, Indiana, Massachusetts, Nebraska, New Jersey, New York, Ohio, Pennsylvania, and Vermont are compared in this section. Before comparing the state data, however, differences between those studies (such as year for which data were obtained) should be noted.

#### 4.5.1 DIFFERENCES IN REI STUDIES

Differences in REI studies can generally be traced to two areas:

- Existing data source changes;
- Methodological changes between studies.

##### 4.5.1.1 EXISTING DATA SOURCE CHANGES

As was discussed in Section 3.2, the SIC system is being eliminated and replaced with the NAICS system. NAICS data was not yet available for the NERC states (Delaware,

Massachusetts, New Jersey, New York, Pennsylvania, and Vermont), Florida, Nebraska, Indiana or Ohio studies when their data was compiled, so 1996 Census SIC data was used. However, 1997 Census NAICS data became available in time to be used for this study as well as the national and California studies.

Apart from the one-year difference in the data and the effect of inflation on fiscal values, the changeover between systems caused some differences in the way certain Census categories were defined, and thus the source data used for certain recycling and reuse business categories. The tire retreaders category includes more establishments in the SIC code than were included when reclassified under NAICS system. Because the tire retreader category is small compared to all the other categories (generally less than one percent of the total for the total recycling and reuse industry), this difference is not thought to significantly affect the overall bottom-line results of state studies.

U.S. Census subdivides iron and steel mills into four sub-components – fully integrated, partially integrated with a blast furnace, partially integrated without a blast furnace, and non-integrated – though it only reports sub-component data on the national level. Non-integrated mills, which do not recycle steel scrap but instead convert steel intermediates made by other steel mills into products, are outside the boundary of the definition for the recycling and reuse industry used in this study. The fact that these conversion mills were included by U.S. Census in state-level iron and steel mill data was not apparent at the time the NERC study was conducted, therefore recycling and reuse industry data for steel mills were overestimated for Delaware, Massachusetts, New Jersey, New York, and Pennsylvania. Data from non-integrated mills were excluded from all other state studies and the US REI study.

It is important to note that non-integrated steel mills are much smaller than integrated steel mills that recycle steel. Although these non-integrated mills represent 64 percent of the number of “steel mill” establishments in the nation, they represent less than 15 percent of employment, payroll, and receipts reported by Census. Furthermore, employment, payroll and receipts are typically much better measures of economic contribution than number of establishments, and the bottom-line impact of including non-integrated mills affected the overall NERC study results by less than 4 percent for these measures.

#### **4.5.1.2 METHODOLOGICAL CHANGE BETWEEN STUDIES**

There was one minor change in methodology among the various REI studies. Census NAICS data for glass container manufacturers were used for this study as well as the California and national studies. Surveys of glass container manufacturers were conducted for all the other state studies because there were too few glass container manufacturers in those states for Census to be able to report that information without disclosing individual company data.

#### **4.5.2 COMPARISON OF REI STUDY RESULTS**

One important conclusion to draw from the REI studies that have been done is that the recycling and reuse industry is not monolithic, but does display variations between states, particularly in the size of establishments. The compost and miscellaneous organics producer category exemplifies this point. Compost sites are distinctly larger in terms of number of employees per establishment, payroll, and receipts in Southern and West Coast states than in Illinois. It is thought that climate and seasonal differences may play a role in the difference, as there is little yard waste to compost in Illinois during the winter.

Considering the caveats discussed above, comparisons were made between states as shown in Figures 4-8 and 4-9. Figure 4-8 shows actual recycling/reuse employment numbers on the left, as well as normalized recycling/reuse employment (on a per 100,000 state population basis) on the right. As the figure shows, Illinois compares favorably to other states, exceeding the normalized national average of recycling and reuse industry employees.

FIGURE 4-8  
COMPARISON OF TOTAL EMPLOYMENT TO NORMALIZED EMPLOYMENT

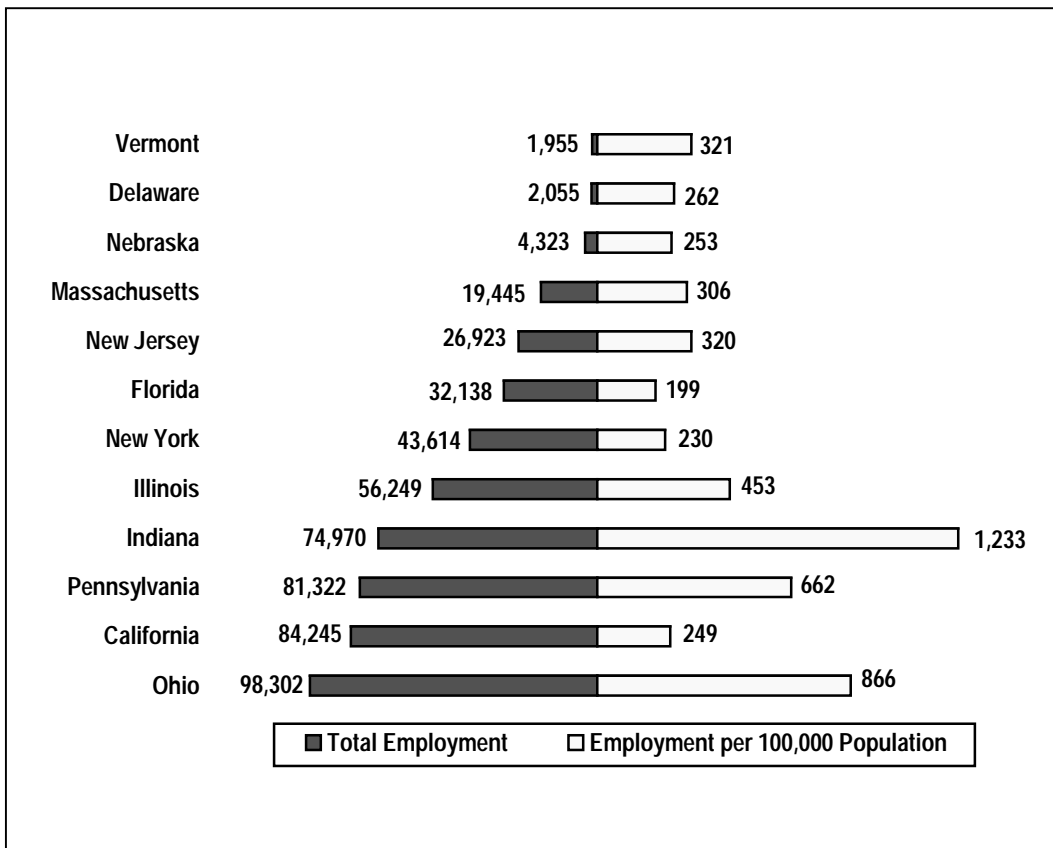


FIGURE 4-9  
EMPLOYMENT BY SECTOR PER 100,000 STATE POPULATION

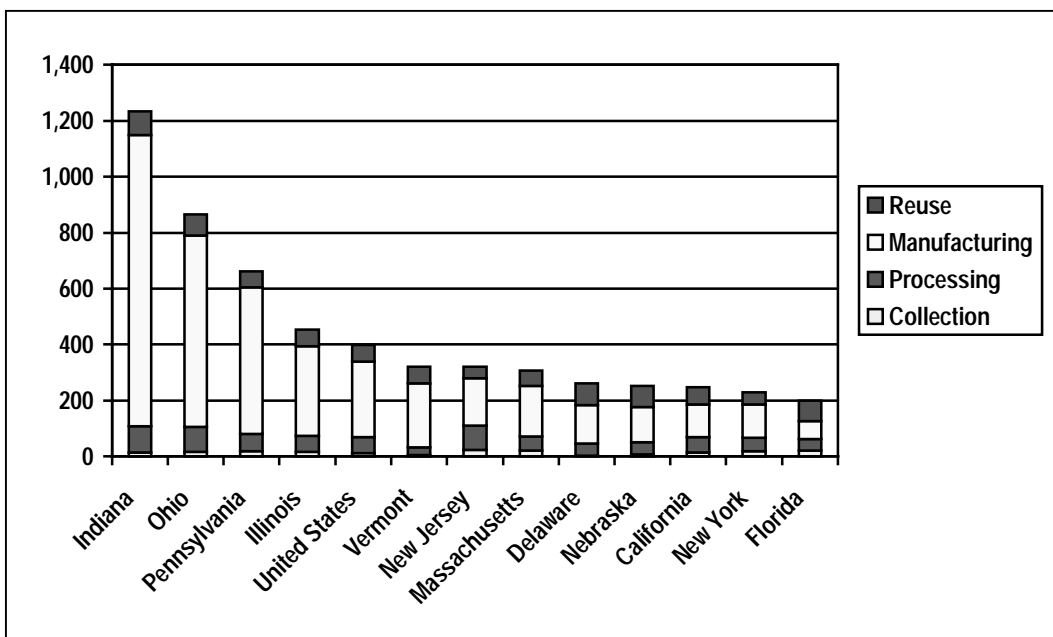


Figure 4-9 shows the components of the normalized data by industry sector. It is informative to note that while the recycling collection, recycling processing, and reuse sectors are fairly close in each state, it is recycling manufacturing that sets states apart. This is particularly apparent in states that have traditionally valued the contribution of manufacturing establishments to their economies, such as Illinois, Indiana, Ohio and Pennsylvania. Furthermore, steel and iron recycling manufacturing business categories are well-developed in each of these four leading states, ranging from approximately 40 percent of the recycling manufacturing total in Illinois to as much as 70 percent of the recycling manufacturing sector total in Indiana.



## **5.1 OVERVIEW**

This study modeled the economic values of twenty-six recycling or reuse categories. Further calculations were made to estimate selected state government revenues that would be associated with the levels of economic activity that were identified through the modeling process. This section provides an overview of the process of input-output modeling, its strengths, its limitations, and its adaptation to this study. This section also defines the terms used. Finally, the model output data are presented and interpreted.

### **5.1.1 INPUT-OUTPUT MODELING PROCESS AND LIMITATIONS**

Economic values or economic effects studies are usually conducted with input-output (I-O) econometric models of a regional economy. Input-output modeling allows researchers to investigate the interdependencies that industries, institutions, and households have with each other in a region of study. I-O models, therefore, relate the products made within a region and the products consumed by industries and households in that same region.

At a basic level, any industry's or institution's output (usually its gross sales) requires employees, materials, utilities, capital investments, financing, maintenance, equipment, and service inputs. The probability that a firm purchases its inputs locally (meaning within the region being modeled) is estimated in the I-O model. Estimates of an industry's inputs mix and whether those inputs are purchased within the region being modeled are based on national and regional industrial surveys.

Primary survey information to update the national or regional statistics is needed to improve the quality of the model output, particularly where the industry segment under study may differ from national or regional averages. As was discussed previously in the Study Methodology section, this study performed limited surveys to obtain additional intermediate input data. Furthermore, it made use of in-house data from previous county-level and state-level modeling projects to further improve the quality of the model that was produced.

There are important limitations to these models that must be acknowledged. First and foremost, absent highly detailed and costly local industry surveys, which were not done for this study, national and regional averages for major industrial input categories (the production functions) and the likelihood of a local purchase of inputs for the industries that were studied (regional purchasing coefficients) were still heavily relied on. Industries that fall within general industrial categories normally have very similar industrial input characteristics. A plastics firm that produces finished goods from recycled stock will be configured very similarly to a plastics firm that produces goods primarily from virgin inputs. Except for the source of their commodity input into production and the physical configuration of their processing machinery, their overall remaining operational characteristics – transportation, utilities, services, maintenance, financial inputs, etc. – are likely to be very similar. Consequently, in most instances, production characteristics of existing firms provided a very good first pass at identifying intra-regional linkages and supply chains of goods and services required for production. Although the I-O model has information on up to 537 industries, there is no specific set of "recycling and reuse" industries. Consequently, the models that were produced were significantly modified to accept recycling and reuse industries distinctly. Furthermore, the use of in-house data and additional surveys for select recycling and reuse industries enhanced the quality of the model output for this study.

Other limits in these types of models include:

- Difficulties in capturing economies of scale, particularly for industries with relatively small numbers of establishments, where establishment-to-establishment variation may be significant (the current input values or production functions are, therefore, initially constant);
- An inability to identify input substitutes – especially in new technologies or in instances where input modes have changed;
- Dated data on industrial performance and purchases, particularly for industries that are newly-emerging or rapidly changing;
- In-state and out-of-state purchases of commodities within a study area are fixed (regional purchasing coefficients must be adjusted if it is suspected that the regional averages are not right); and
- An implicit assumption that input commodity supply is infinite and perfectly elastic.

I-O models, therefore, are just that – models – that simulate industrial inter-dependencies in the current economy under study. I-O models are not the best models for forecasting because they model the existing economy, and do not forecast the net impact of replacing a virgin-commodity establishment with a recycled-commodity establishment, for example, or the availability of suitably-trained workers to accommodate industry growth. I-O models, therefore, have limits. Nevertheless, I-O models are comparably much less expensive to produce than more involved models, do an excellent job of estimating the role a particular industry has (such as the recycling industry) on a specific economy, and are useful for projecting the affects of modest changes in an industry.

The generic term “economic impact” is frequently used to describe a set of economic activities in a region. This term often suffers from misapplication. There are several kinds of economic activities that may occur within a particular region. For example:

- Firms may produce goods or provide services for export outside the region. They attract outside funds into the region that supports employment, industrial purchases, and household spending.
- Firms may substitute locally produced commodity inputs for those that previously were purchased from outside the region. In this case funds are retained in the region and flow to local suppliers to an industry.
- Firms may produce goods and services for local consumption (either by industries or by households). Although they may help to retain funds in the region, they may not cause significant additional economic activity.

I-O models identify the overall size and contribution of an industry – its *economic effect* or *economic value* – to the area mix of economic activity along with interdependencies that exist between it and other firms or service suppliers. In other words, the strength of linkages that exist among industries and the overall value (output, incomes, and jobs) of their production. The impact of an industry hasn’t yet been determined.

In the case of firms that produce finished goods for export outside a region, there is a measurable *economic impact* – were it not for the external demand for the locally-produced product, the economic activity would not be in the local economy.

A much harder measure of potential economic impact falls into the category of import substitution. If a region is able to develop indigenous industries that produce a good that substitutes for a good that is imported, then that industry is *retaining* dollars in the state that used to be exported. An industry that produces a good using recycled feedstock that is supplied locally will create a product that substitutes local inputs for non-local inputs. Recycling industries often fit into the import substitution category, particularly in states

without virgin feedstock production infrastructures. By utilizing recycled content, they are purchasing locally and, therefore, stimulating indigenous economic activity.

This study generally reserves the use of the term *economic impact* only for:

- Industries that have verifiable levels of exports where the output that they are producing is a genuine and real increase in regional industrial output;
- True import substitutes; and
- Policy or program changes that result in increases in recycling and reuse and accompanying increases in industrial output.

To claim economic impacts involves much more extensive industrial measures for each category of establishments that was assessed in this study, and over a period of time because impacts are referenced from a particular point in time.

This study, therefore, reports *total economic values* of the current recycling and reuse industry – estimates, by category, of the value of economic inter-relationships that exist for the industry. These values are the intrinsic worth of a set of industrial activities – they represent a slice of the economic pie from a particular point of view. Impacts are presented for projected increases in recycling that result from three industry growth scenarios that are driven by proposed policy and program changes.

In summary, economic models are estimates of inter-industrial linkages and regional values. They are based on an amalgam of federal, county, and state data, academic procedures, along with some survey-derived direct data, all compiled with due diligence for accuracy and reasonableness. Consequently, although an inter-industrial accounting framework is implied, all estimates are simulations of economic values based on the data employed and the assumptions implicit in the modeling.

### 5.1.2 KINDS OF ECONOMIC INFORMATION PRODUCED BY I-O MODELS

Input-output models produce many kinds of data for analysis and decision making. The more useful results for industrial leaders, planners, and policy makers are estimates of (1) total industrial output, (2) personal income, (3) value added, and (4) jobs. These are the categories of economic activity that are reported in detail in the data tables that follow this section. These terms are defined below:

- *Total industrial output* for most private industries is simply gross sales. For public or quasi-public institutions this normally includes all public outlays, along with the value of government sales and other subsidies received, to isolate the current economic value of their output to the citizens or the area served.
- *Personal income* includes the wages and salaries of employees and proprietors, normal profits to sole proprietors, and an estimate of the cash value of all benefits (e.g., social insurance, retirement, and medical benefits).
- *Value added* is a measure of gross regional product. It includes all personal income (employment compensation, incomes to sole proprietors) plus property incomes (dividends, interests, and rents), and indirect tax payments (primarily excise and sales taxes paid by individuals to businesses).
- *Jobs* is the number of full- and part-time positions in the economy, not the number of full-time-equivalents.<sup>22</sup> This distinction is important because the relationship between job growth and labor force growth is very different in different industries. Some

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<sup>22</sup> For example, a restaurant may employ 20 people on a half-time basis (20 jobs) to fill its labor requirement of 10 full-time-equivalents.

industries rely heavily on semi-skilled part-time labor. Other industries generally produce full-time skilled jobs. It is always important, when possible, to quantitatively assess whether the jobs that are stimulated are part-time or full-time or higher-paying versus lower-paying.

Economic data is further reported as direct, indirect, induced, and total economic effects.

- *Direct effects* refer to the operational characteristics of the firms or institutions that are studied. This study measured the apparent value of twenty-six categories of recycling and reuse establishments. The direct output of these entities is, therefore, their reported gross sales. The direct jobs are the jobs that are associated with those establishments. The direct personal income contains their reported payments to all employees, plus an additional estimate of benefit values and of returns to sole proprietors. The estimate of benefit values and returns to sole proprietors were based on industrial averages in industries that are similar to the recycling and reuse industries included in this study.
- *Indirect effects* measure the value of additional economic demands that the direct firms or institutions place on supplying industries in the region. When firms produce goods or conduct business or when public entities provide public services, they must make many purchases. Some of these are from suppliers in the area. Some are not. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, raw and processed commodities, and a variety of professional services are necessary to produce the direct values described above.
- *Induced effects* accrue when workers in the direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects, and the terms are often used inter-changeably. When workers in direct and indirect industries purchase goods and services for household consumption, they, in turn, stimulate another layer of the economy. Most induced activity accrues to retail, services, and finance, insurance, and housing spending. Because employment is stimulated in these industries as well, *their* demands for inputs increase, yielding an additional round or additional rounds of indirect purchases and additional rounds of induced activity. The I-O models solve for these iterative rounds of transactions until all of the possible inter-industrial transactions have been accumulated.
- *Total economic effects* are the sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities of establishments in the business categories included in this study.

The term *multiplier* or *multiplier effect* is frequently used when referring to economic effects or economic impacts. There are different kinds of multipliers – this study reports two types. The Type I multiplier identifies the value of direct and indirect transactions – e.g., the output of a business category and all other output that it purchases from its suppliers in the region – relative to the value of only the direct transactions. The Type II multiplier identifies the value of all economic transactions (direct, indirect, and induced) that are stimulated in the economy by an industry under study, including the personal spending of employees throughout the supply chain whose economic activity is apportioned to the industry, relative to the value of only the direct transactions.

## 5.2 RESULTS

Table 5-1 shows estimates of economic activity accruing to establishments in business categories that provide goods or services to recycling and reuse industry establishments. The category Other Indirect Establishments shown in the table includes all other indirect establishments that provide goods or services (such as office supply companies, accounting firms, legal firms, building and landscape maintenance firms, etc.).

As Table 5-1 shows, the indirect economic activity accruing to Recycling and Reuse Equipment Manufacturers and Transporters composes a significant portion of the total indirect effects, representing 9-13 percent depending on the data type that is considered. It is important to note that the data for Recycling and Reuse Equipment Manufacturers is based on a statistical analysis of survey data and therefore represents complete data for those types of establishments located in a state regardless of where they sell their equipment. Totals for the other categories represent indirect activity relating to only the 26 categories of recycling and reuse industry establishments located in Illinois that were investigated for this study.

**TABLE 5-1**  
**ESTIMATES OF INDIRECT ECONOMIC ACTIVITY OF SELECT SUPPORT BUSINESS CATEGORIES**

(ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000)

Business Category	Data Type	Value
Recycling and Reuse Equipment Manufacturers <sup>[1]</sup>	Employment	1,708
	Annual Payroll	49,479
	Estimated Receipts	367,589
Consulting/Engineering <sup>[2]</sup>	Employment	383
	Annual Payroll	19,171
	Estimated Receipts	39,380
Transporters <sup>[2]</sup>	Employment	1,898
	Annual Payroll	180,981
	Estimated Receipts	252,437
Other Indirect Establishments <sup>[2]</sup>	Employment	36,763
	Annual Payroll	1,456,970
	Estimated Receipts	5,090,330
Support Businesses Totals	Employment	40,752
	Annual Payroll (\$1,000)	1,706,600
	Estimated Receipts (\$1,000)	5,749,735

<sup>[1]</sup> Data for Recycling and Reuse Equipment Manufacturers are based on a statistical analysis of survey results.

<sup>[2]</sup> Data come from modeling output and reflect the indirect activity stimulated by the 26 direct categories of recycling and reuse establishments targeted by this study for direct data.

Listed below in Table 5-2 are the titles of data tables that follow and a description of the information they contain.

**TABLE 5-2**  
**GUIDE TO DATA TABLES**

Number	Title	Information Contained
Table 5-3	Recycling and Reuse Industry Economic Values and Multipliers	Shows direct, indirect, and induced economic values and multipliers for the 26 categories of recycling and reuse establishments
Table 5-4	Recycling and Reuse Industrial Multipliers Compared to Multipliers for Other Industries	Shows multipliers for the recycling and reuse industry as compared to multipliers for other major industrial sectors
Table 5-5	Summary Of Recycling & Reuse Industry Contribution To Government Revenues	Shows totals for state and local revenues from the direct economic activity of the recycling collection, processing, manufacturing, and reuse industry sectors
Table 5-6	Summary of Recycling & Reuse Industry Effects on Own-Source State Government Revenues	Shows state taxes, charges and fees, miscellaneous revenues, and total state revenues associated with direct and total economic values for the 26 recycling and reuse establishment categories

## SECTION 5

**TABLE 5-3**  
**RECYCLING AND REUSE INDUSTRY ECONOMIC VALUES AND MULTIPLIERS**

	Jobs <sup>1</sup>				Jobs Multiplier		Personal Income (in \$ Millions)				Income Multiplier		Industrial Output (in \$ Millions)				Output Multiplier		Value Added (in \$ Millions)				Value Added Multiplier	
	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II	Direct	Indirect	Induced	Total	Type I	Type II
<b>Recycling Collection</b>																								
1. Government Staffed Residential Curbside Collection	900	35	338	1,272	1.04	1.41	31	1	12	45	1.05	1.42	63	4	31	99	1.06	1.55	56	2	19	77	1.04	1.38
2. Private Staffed Residential Curbside Collection	1,200	105	546	1,852	1.09	1.54	49	4	19	72	1.09	1.48	84	11	50	146	1.13	1.73	65	7	31	103	1.10	1.58
Subtotal	2,100	140	884	3,124	1.07	1.49	80	6	31	117	1.07	1.46	148	15	82	244	1.10	1.65	121	9	50	180	1.07	1.49
<b>Recycling Processing</b>																								
3. Compost and Miscellaneous Organics Producers	325	120	125	570	1.37	1.76	7	5	4	16	1.65	2.25	27	12	12	51	1.45	1.88	10	7	7	24	1.72	2.42
4. Materials Recovery Facilities (MRFs)	691	315	293	1,299	1.46	1.88	15	13	10	37	1.87	2.54	44	22	16	81	1.49	1.86	20	19	16	55	1.97	2.77
5. Recyclable Material Wholesalers	6,104	2,713	4,404	13,221	1.44	2.17	201	68	97	366	1.34	1.82	3,003	928	1,472	5,403	1.31	1.80	289	80	127	496	1.28	1.72
Subtotal	7,120	3,148	4,822	15,091	1.44	2.12	223	85	111	419	1.38	1.88	3,073	962	1,500	5,535	1.31	1.80	319	106	150	575	1.33	1.80
<b>Recycling Manufacturing</b>																								
6. Glass Container Manufacturing Plants	1,053	558	689	2,300	1.53	2.18	42	24	24	90	1.57	2.14	181	70	63	314	1.38	1.73	67	38	39	144	1.57	2.15
7. Glass Product Producers (other recycled uses)	232	58	81	370	1.25	1.60	5	2	3	11	1.46	1.98	20	7	7	34	1.34	1.71	9	4	5	18	1.43	1.92
8. Nonferrous Secondary Smelting and Refining Mills	1,104	2,201	1,709	5,014	2.99	4.54	47	98	54	199	3.07	4.21	667	278	140	1,085	1.42	1.63	65	158	87	311	3.42	4.76
9. Nonferrous Product Producers	2,799	3,401	2,982	9,182	2.22	3.28	121	155	100	376	2.28	3.11	864	474	263	1,600	1.55	1.85	178	246	162	587	2.39	3.30
10. Nonferrous Foundries	4,310	994	1,938	7,242	1.23	1.68	143	45	68	255	1.31	1.79	495	143	178	816	1.29	1.65	341	70	110	520	1.21	1.53
11. Paper, Paperboard, and Deinked Market Pulp Mills	1,006	896	905	2,807	1.89	2.79	47	40	31	117	1.85	2.52	277	115	82	474	1.42	1.71	72	62	51	185	1.86	2.56
12. Paper-Based Product Manufacturers	143	101	112	356	1.70	2.49	6	4	4	15	1.71	2.33	31	13	10	54	1.40	1.73	10	7	6	23	1.71	2.35
13. Pavement Mix Producers (asphalt and aggregate)	(D)	(D)	(D)	(D)	1.26	1.60	(D)	(D)	(D)	(D)	1.52	2.06	(D)	(D)	(D)	(D)	1.22	1.53	(D)	(D)	(D)	(D)	1.17	1.40
14. Plastics Reclaimers	1,268	817	768	2,853	1.64	2.25	38	34	26	97	1.89	2.58	107	53	39	199	1.50	1.86	52	53	42	146	2.02	2.82
15. Plastics Converters	12,195	7,858	7,384	27,438	1.64	2.25	378	337	258	974	1.89	2.58	1,944	968	711	3,623	1.50	1.86	519	527	420	1,465	2.02	2.82
16. Rubber Product Manufacturers	226	53	139	418	1.23	1.85	11	2	5	18	1.18	1.61	23	5	13	40	1.23	1.80	14	3	8	25	1.20	1.76
17. Steel Mills	9,199	12,153	10,344	31,696	2.32	3.45	425	540	350	1,315	2.27	3.09	2,943	1,544	920	5,407	1.52	1.84	555	868	567	1,991	2.56	3.58
18. Iron and Steel Foundries	5,789	3,238	3,728	12,755	1.56	2.20	211	138	127	476	1.65	2.25	791	366	334	1,491	1.46	1.88	254	217	206	676	1.85	2.66
19. Other Recycling Processors/Manufacturers	257	117	109	482	1.46	1.88	6	6	4	16	1.87	2.54	57	28	21	106	1.49	1.86	9	9	7	25	1.97	2.77
Subtotal	39,580	32,446	30,888	102,914	1.82	2.60	1,482	1,425	1,054	3,960	1.96	2.67	8,399	4,062	2,783	15,244	1.48	1.81	2,145	2,262	1,709	6,116	2.05	2.85
<b>Reuse/Remanufacturing</b>																								
20. Computer and Electronic Appliance Demanufacturers	232	91	99	422	1.39	1.82	6	4	3	13	1.73	2.36	23	12	9	44	1.55	1.95	8	6	6	20	1.81	2.53
21. Motor Vehicle Parts (used)	2,137	1,150	1,089	4,377	1.54	2.05	53	53	38	143	2.00	2.72	246	154	100	500	1.62	2.03	70	83	62	214	2.19	3.08
22. Retail Used Merchandise Sales	3,632	1,424	1,077	6,133	1.39	1.69	49	55	38	142	2.12	2.89	221	132	99	452	1.60	2.05	80	84	61	226	2.05	2.81
23. Tire Retreaders	487	194	222	904	1.40	1.86	13	8	8	29	1.61	2.20	58	23	20	101	1.39	1.74	22	13	13	48	1.59	2.16
24. Wood Reuse	312	141	140	593	1.45	1.90	8	6	5	19	1.81	2.46	26	17	13	56	1.65	2.14	9	9	8	26	1.92	2.78
25. Materials Exchange Services	(D)	(D)	(D)	(D)	1.04	1.78	(D)	(D)	(D)	(D)	1.02	1.39	(D)	(D)	(D)	(D)	1.04	1.80	(D)	(D)	(D)	(D)	1.03	1.58
26. Other Reuse	649	447	365	1,461	1.69	2.25	17	18	13	48	2.05	2.79	73	46	34	152	1.63	2.08	24	28	21	73	2.20	3.06
Subtotal	7,449	3,448	2,993	13,890	1.46	1.86	146	144	104	394	1.99	2.71	647	384	275	1,306	1.59	2.02	213	224	169	606	2.05	2.85
<b>Total All Groups</b>	<b>56,250</b>	<b>39,182</b>	<b>39,587</b>	<b>135,018</b>	<b>1.70</b>	<b>2.40</b>	<b>1,930</b>	<b>1,660</b>	<b>1,300</b>	<b>4,891</b>	<b>1.86</b>	<b>2.53</b>	<b>12,267</b>	<b>5,423</b>	<b>4,639</b>	<b>22,330</b>	<b>1.44</b>	<b>1.82</b>	<b>2,798</b>	<b>2,601</b>	<b>2,079</b>	<b>7,477</b>	<b>1.93</b>	<b>2.67</b>

<sup>1</sup> Includes all full- and part-time jobs (not full-time equivalents).

(D) - Data not disclosed due to a limited number of establishments in this business category and the need to avoid revealing data that could identify a single business.

TABLE 5-4  
RECYCLING AND REUSE INDUSTRY MULTIPLIERS COMPARED TO MULTIPLIERS FOR OTHER MAJOR  
ILLINOIS INDUSTRIAL SECTORS

	Output		Jobs		Personal Income		Value Added	
	Type I	Type II	Type I	Type II	Type I	Type II	Type I	Type II
<i>Recycling &amp; Reuse</i>	1.44	1.82	1.69	2.40	1.86	2.53	1.92	2.66
Agriculture	1.53	2.03	1.29	1.65	1.59	2.28	1.62	2.32
Mining	1.39	1.88	1.43	2.17	1.45	2.07	1.36	1.89
Construction	1.65	2.33	1.59	2.42	1.55	2.23	1.76	2.73
Manufacturing	1.71	2.23	2.17	3.49	1.96	2.83	1.99	2.90
Transportation, Communications, & Utilities	1.36	1.85	1.57	2.54	1.45	2.09	1.34	1.84
Wholesale Trade	1.33	1.92	1.46	2.36	1.35	1.94	1.29	1.83
Retail Trade	1.25	1.89	1.09	1.38	1.19	1.70	1.19	1.71
Financial, Insurance, & Real Estate	1.27	1.63	1.47	2.30	1.41	2.04	1.23	1.54
Services	1.36	2.15	1.23	1.80	1.25	1.80	1.32	2.07
Government	1.11	2.02	1.05	1.58	1.05	1.49	1.07	1.69
Other	1.00	1.72	1.00	1.13	1.00	1.42	1.00	1.45

TABLE 5-5  
SUMMARY OF RECYCLING & REUSE INDUSTRY  
CONTRIBUTION TO GOVERNMENT REVENUES

(IN \$ MILLIONS)

Industry Sector	Direct Effects Revenues			Total Effects Revenues		
	State	Local	Total	State	Local	Total
Recycling Collection	5.7	5.5	11.1	8.3	8.0	16.2
Recycling Processing	15.8	15.3	31.1	29.7	28.7	58.4
Recycling Manufacturing	105.4	101.8	207.1	281.4	271.7	553.1
Reuse/Remanufacturing	10.3	10.0	20.3	28.0	27.0	55.0
Total	137.2	132.5	269.7	347.3	335.4	682.7

**TABLE 5-6**  
**SUMMARY OF RECYCLING & REUSE INDUSTRY EFFECTS ON**  
**OWN-SOURCE STATE AND LOCAL GOVERNMENT REVENUES**  
 (IN \$ MILLIONS)

	Government Revenues from Industry Direct Effects			Government Revenues from Industry Total Effects		
	State	Local	Total	State	Local	Total
<b>Recycling Collection</b>						
1. Government Staffed Residential Curbside Collection	2.2	2.1	4.4	3.2	3.0	6.2
2. Private Staffed Residential Curbside Collection	3.4	3.3	6.8	5.1	4.9	10.0
Subtotal	5.7	5.5	11.1	8.3	8.0	16.2
<b>Recycling Processing</b>						
3. Compost and Miscellaneous Organics Producers	0.5	0.5	1.0	1.2	1.1	2.3
4. Materials Recovery Facilities (MRF's)	1.0	1.0	2.0	2.6	2.6	5.2
5. Recyclable Material Wholesalers	14.2	13.8	28.0	25.9	25.0	50.9
Subtotal	15.8	15.3	31.1	29.7	28.7	58.4
<b>Recycling Manufacturing</b>						
6. Glass Container Manufacturing Plants	3.0	2.9	5.9	6.4	6.2	12.6
7. Glass Product Producers (other recycled uses)	0.4	0.4	0.7	0.8	0.7	1.5
8. Nonferrous Secondary Smelting and Refining Mills	3.3	3.2	6.6	14.1	13.6	27.7
9. Nonferrous Product Producers	8.6	8.3	16.9	26.6	25.7	52.3
10. Nonferrous Foundries	10.1	9.8	19.9	18.0	17.4	35.5
11. Paper, Paperboard, and Deinked Market Pulp Mills	3.3	3.2	6.5	8.3	8.0	16.3
12. Paper-Based Product Manufacturers	0.4	0.4	0.9	1.0	1.0	2.0
13. Pavement Mix Producers (asphalt and aggregate)	0.5	0.5	1.0	1.0	1.0	2.1
14. Plastics Reclaimers	2.7	2.6	5.2	6.9	6.6	13.5
15. Plastics Converters	26.8	25.8	52.6	68.9	66.6	135.5
16. Rubber Product Manufacturers	0.8	0.8	1.6	1.3	1.3	2.6
17. Steel Mills	30.1	29.1	59.1	93.1	89.9	183.0
18. Iron and Steel Foundries	15.0	14.4	29.4	33.7	32.6	66.3
19. Other Recycling Processors/Manufacturers	0.5	0.4	0.9	1.2	1.1	2.3
Subtotal	105.4	101.8	207.1	281.4	271.7	553.1
<b>Reuse/Remanufacturing</b>						
20. Computer and Electronic Appliance Demanufacturers	0.4	0.4	0.8	0.9	0.9	1.8
21. Motor Vehicle Parts (used)	3.7	3.6	7.3	10.1	9.8	19.9
22. Retail Used Merchandise Sales	3.5	3.4	6.8	10.0	9.7	19.8
23. Tire Retreaders	0.9	0.9	1.9	2.1	2.0	4.1
24. Wood Reuse	0.5	0.5	1.0	1.3	1.3	2.6
25. Materials Exchange Services	<0.1	<0.1	0.1	0.1	0.1	0.1
26. Other Reuse	1.2	1.2	2.4	3.4	3.3	6.7
Subtotal	10.3	10.0	20.3	28.0	27.0	55.0
<b>Total All Groups</b>	<b>137.2</b>	<b>132.5</b>	<b>269.7</b>	<b>347.3</b>	<b>335.4</b>	<b>682.7</b>

### 5.3 INTERPRETATION OF RESULTS

This section is intended to aid readers in interpreting the results of the tables in the previous section.

Economic values are most accurate at the business category level. Summing totals by groups of recycling or reuse activity for the state as a whole (as has been done in the tables) results in some degree of duplicated accounting of economic activity. This is true for any set of industrial assessments in any input-output modeling scenario – it is not a problem with recycling, *per se*, nor with this study, but arises simply because of the many business categories that are included in this study.



For example, direct sales by a raw commodity processor represent an input purchase by an industry producing a finished good for sale. A large portion of the raw commodity processor's direct sales is already reflected in the finished good industry's input purchases. In this case, then, aggregation biases the economic values in the subtotals and totals upwards. As a general rule, the higher the Type I multiplier (which is a measure of how strongly a firm depends on supplier inputs), the higher the probability of aggregation bias in reporting subtotals and totals. This is an inherent "Catch 22" in input-output modeling: to eliminate aggregation bias of this sort, the industries must be lumped together in the construction of the model so that inter-industrial transactions are properly accounted and the resulting multipliers are properly dampened. Doing so, however, eliminates the industrial detail that is desired.

Nevertheless, subtotals and totals have been produced so that relative comparisons can be made. Users of these findings, however, must be cautious to avoid claims about the recycling and reuse industry that may be unwarranted given that there is some degree of inflation in the subtotals or totals. Based on other modeling experience, it is believed that aggregation bias may have inflated the subtotals and totals by up to 15 percent, and possibly higher. It is important to note that this bias is associated with any total that is derived from indirect and induced information, including total economic activity, subtotal/total multipliers, and total government tax revenues. Alternatively, **totals derived only from direct information and government tax revenues derived from direct economic activity do not include bias.**

Multipliers reveal potential changes in the regional economy attributable to a change in direct activity in a particular industry in that same economy. Multipliers can be instructive for anticipating economic growth, in the case of a new or expanding firm, and economic decline, in the case of a plant closing. Economic multipliers are often misunderstood and therefore improperly used. Developers, planners, and decision-makers frequently use national level multipliers that are produced by the U.S. Bureau of Economic Analysis (BEA) as points of comparison. These multipliers are called RIMS II (Regional Input-Output Multiplier System), and they are widely used by development groups to support economic investment or public spending. Multipliers are available for over 500 industries in the categories of earnings, employment, and industrial output. Many users, however, mistakenly apply these statistics because they:

- Fail to account for regional production and cost of living differences (detailed multipliers are available at the state and county level, but project promoters often rely on national averages due to costs);
- Use the wrong multiplier to describe a phenomenon (multipliers for different categories of economic activity can vary substantially); or
- Seek to promote industries with the largest multipliers possible without consideration of either the appropriateness of the application or of the actual scope of local production.

The reader can be assured that this study produced Type I and Type II multipliers that are specific to Illinois and are not directly derivative of national averages.

Before making any comparisons among multipliers, it is important to understand what influences them. Firms with strong linkages to area supplying firms or that pay relatively high wages may yield comparatively higher multipliers. Firms that are otherwise not linked strongly to local suppliers or that pay lower than average wages will usually produce lower multipliers. More urbanized areas and states with larger and more diversified economies have, on the average, much higher multipliers than less populated, more rural states for the same types of businesses.

Given the above guides to interpreting the data, there are a couple of general conclusions that can be drawn:

- Illinois non-ferrous smelting and refining mills, non-ferrous product producers, and steel mills tended to have higher multipliers than establishments in other business categories (Table 5-3).
- When compared to other primary economic sectors, the Illinois recycling and reuse industry surpasses all but the manufacturing sector in terms of multiplier size (Table 5-4).
- The recycling and reuse industry is responsible for significant state and local government tax revenues, totaling over \$680 million per year when indirect and induced economic activity are included. These revenues are nearly split equally between the state and local governments (Table 5-5).
- Investments in local recycling collection and processing and policies that encourage recycling and reuse yield significant state and local government revenues from downstream economic activity. For example, 81 percent of total recycling and reuse industry tax revenues arise from recycling manufacturing establishments and their indirect and induced economic activity (Tables 5-4 and 5-5).

Recycling manufacturing establishments are critical to the strength of Illinois' recycling and reuse industry and overall state economy. This industrial sector has a demand for more recovered materials than are recovered in the state – thus materials must be imported from other states and countries. Many of the intermediate products of recycling manufacturing establishments support other manufacturing jobs in the state or result in the flow of profits into the state from the sale of those products outside Illinois' borders. Illinois' economy significantly benefits from this industrial sector in terms of the jobs it provides, support it gives to the state's manufacturing base and other economic sectors, and tax revenues that flow to the state and local governments.

Even though some categories have lower multipliers than other categories, they are still important to the overall recycling and reuse industry. For example, recycling manufacturing establishments, which tend to have higher multipliers, rely on recycling collection and processing establishments to provide them with recovered materials. Recycling collection and processing establishments – even though they tend to have lower multipliers – are critical and necessary links in the recycling chain and should be valued and supported as much as establishments in other categories with higher multipliers.

## SECTION 6

### FUTURE GROWTH SCENARIOS

In addition to gathering economic information on the current Illinois recycling and reuse industry, this study also summarized information on barriers and impediments to increased recycling and reuse activity, the ability of policy and programs to promote future growth, and the cost and benefits associated with various policy and program options. Furthermore, projections of the economic impacts of three specific industry growth scenarios were made. The three scenarios were:

- Achieving a 35 percent state recycling rate;
- Achieving a 50 percent state recycling rate; and
- Banning the disposal of electronics in Illinois landfills.

#### 6.1 BARRIERS AND IMPEDIMENTS TO INCREASED RECOVERY

Many products that could be easily diverted for recycling are disposed. The reasons are many and varied, and differ from product to product. Barriers and impediments to increased recovery can be generally grouped into four general areas:

1. Recovery Infrastructure – are there convenient recyclables collection, processing, and transportation infrastructures in place?
2. Behavior – do people participate in available programs, and if they participate to what extent are they capturing all recyclables?
3. Economics – do low disposal costs limit reaching higher recovery rates?
4. End Markets – is there sufficient end market capacity for new recovered materials or increases in recovery of materials already targeted?

The following sections discuss barriers and impediments to increased recycling in general, and specifically identify those barriers and impediments that apply to the three industry growth scenarios considered as part of this analysis.

##### 6.1.1 RECOVERY INFRASTRUCTURE

###### 6.1.1.1 COLLECTION INFRASTRUCTURE

Roughly two-thirds of Illinoisans have access to a convenient residential recyclables collection program. In this report, “convenient” refers to curbside recyclables collection for single-family homes and on-site recyclables collection for multi-family residences. The fact that a full one-third of Illinois residents lack convenient recycling access is an impediment to increased recovery, particularly if 35 percent and 50 percent recycling rates are desired. Although it is estimated that 77 percent of single-family homes are provided with curbside recyclables collection access, only 20 percent of multi-family residences have similar collection access.<sup>23</sup>

Accurate data on the number or percentage of industrial, commercial, or institutional (ICI) establishments that have implemented recycling programs is not available, though it is believed to be extensive. In fact, R. W. Beck estimates that as much as 80 percent, and perhaps more, of the total tons of recyclables that are recovered in Illinois are diverted from

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<sup>23</sup> Based on statistics gathered by the Illinois Recycling Association’s 1998 State Recycling Survey.

the non-residential ICI waste stream, even though this waste stream composes an estimated 50 to 60 percent of the total waste generated. The recyclables commonly targeted by these types of non-residential programs include scrap metal, paper (primarily corrugated boxes and office paper), construction and demolition debris, and other materials. Achieving 35 and 50 percent statewide recycling rates will require increases in the collection of commercially-generated recyclables.

Even when recyclables collection programs are established, they normally target only a few items that may not compose a large portion of the total solid waste stream as generated. For example, residential recyclables collection programs normally target approximately one-quarter of the solid waste that is generated at residences. Thus a lack of collection access for a broader range of materials is an impediment to increased diversion – particularly for the electronics recycling scenario. Establishing a ban on electronics disposal will require establishing a recycling collection infrastructure for electronics beyond the repair and reuse industries that currently exist.

### 6.1.1.2 PROCESSING INFRASTRUCTURE

While processing infrastructure<sup>24</sup> can be said to be sufficient for current levels and materials targeted for recycling, the infrastructure will need to increase commensurately with increasing levels of diversion, as most facilities are fairly well utilized at current levels of diversion. Furthermore, increases in the numbers of materials recovered in existing or new recovery programs may require facility technology and equipment retrofits so that additional sorts or processes can be performed. Examples of such retrofits include installing mechanized sorting systems for mixed paper collection, upgrading separation systems for recyclables that are collected in a single commingled stream (e.g., single-stream curbside collection and bag-based collection), and establishing processing systems for electronics.

If significant diversion increases or disposal bans are targeted for select materials – such as electronics, construction and demolition debris, or other specific materials – new processing facilities will need to be constructed.

### 6.1.1.3 TRANSPORTATION INFRASTRUCTURE

Illinois has one of the best transportation infrastructures in the United States for recovered materials, with excellent access to a variety of modes of transportation including interstate highway, rail, Great Lakes shipping, and Mississippi River barge shipping. Only two other states exceed Illinois in the number of interstate highway miles in their states – Texas and California – and those states are significantly larger in geographic size and population than Illinois. Transportation infrastructure can therefore be considered very good, even at increased levels of recovery.

Illinois also enjoys close proximity to many major markets for recovered materials that are located either instate or in adjoining states. For example, 25 percent of national recovered paper consumption by paper and paperboard mills occurs in Illinois and adjoining states. Similar statements can be made concerning ferrous and non-ferrous metals markets.

## 6.1.2 BEHAVIOR

### 6.1.2.1 PARTICIPATION

Even when people have convenient access to recyclables collection programs they do not always participate. A typical participation rate for weekly single-family home curbside

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<sup>24</sup> “Processing” as used here refers to sorting, removing contaminants, and/or densifying recovered material on the local level for shipment to reclamation and manufacturing facilities.

collection programs is around 70 percent.<sup>25</sup> Other programs where collection is less frequent, where storage containers/space is lacking (e.g., apartments), or where residents must purchase special bags to place their recyclables in may have lower participation rates.

### 6.1.2.2 CAPTURE

Capture refers to the percentage of available targeted recyclables that are diverted from disposal by those who participate in recycling programs. Even among those who participate in recycling programs, it is common that the capture rate is less than 100%. Typically, capture rates for containers at participating households vary from 55 percent for plastic bottles to 80 percent for glass containers.<sup>26</sup> A few of the reasons for less than full recovery include:

- Undersized collection bins or containers that lead to disposal of recyclables after the recyclables collection container fills;
- Contamination by contained products that don't rinse out easily (or spoilage of the contents) leading to disposal of the container;
- Confusion over which products are targeted (this is particularly the case for plastic bottles that are not beverage containers), and being taught "when in doubt leave it out"; and
- Lack of participation by all householders, even though at least one householder does segregate recyclables.

### 6.1.3 ECONOMICS

The role of local governments is to provide for the public good. In many jurisdictions, local governments have concluded that the public good requires governmental involvement in ensuring that solid waste collection services are provided to single-family residences at fair prices. In some cases this involvement includes providing municipal collection of solid waste; in other cases, local governments set up franchises or contracts with private collectors to provide established service levels at set prices. When local governments do not participate in solid waste collection, free-market open competition occurs among private waste haulers or citizens self-haul to public or private disposal locations.

In many cases, local governments have concluded that there is not a need for them municipal involvement in the collection of solid waste from multi-family homes and commercial establishments. The greater generation amounts and consolidation of solid waste from these types of establishments in many cases can ensure adequate competition and efficient collection.

When local governments are involved in the collection of solid waste, either directly or through contracts or franchises, they can control the services that are provided (e.g., providing recyclables collection services) and where solid waste is ultimately disposed if they so elect. In open competition haulers typically decide if there is an economic incentive to offer recyclables collection services and customers decide if they want to pay for those services and participate in the available programs. Furthermore, in open systems local governments cannot pass "flow control" ordinances, meaning that the solid waste hauler can choose the lowest-cost disposal site, including disposal sites that are located out-of-state.<sup>27</sup> Because comprehensive recyclables collection programs are often more expensive than

<sup>25</sup> Participation, as measured over an extended period of time (such as one month) is always greater than the percentage of homes that set out recyclables on a given collection day.

<sup>26</sup> "How to Collect Plastics for Recycling," the American Plastics Council, 1995.

<sup>27</sup> Carbone Inc. v Town of Clarkstown, NY, U.S. Supreme Court, 1994.

disposal, many business and apartment managers elect to not provide for comprehensive recycling programs. Thus, it can be said that the low cost of solid waste disposal is an obstacle to increased recycling.

In an attempt to level the competitive playing field for all solid waste collection service providers, some local governments have passed commercial recycling ordinances that require recycling programs. In Illinois, areas with these ordinances have a weighted average recycling rate of 45 percent, compared to the state's overall 35 percent recycling rate as reported by the Illinois Environmental Protection Agency.<sup>28</sup> It should be noted that the City of Chicago with its reported 47 percent recycling rate contributes most heavily to the 45 percent weighted average recycling rate because of its size.

### 6.1.4 END MARKETS

In order to close the recycling loop, recovered materials must be purified and incorporated by manufacturers into new products. Manufacturers evaluate the performance and aesthetics requirements of the products they produce when considering whether to use recycled raw materials in their manufacturing processes. However, because product manufacturing is the domain of the private sector, economics invariably weighs heavily in any discussion involving consumption of recovered materials compared to alternative virgin and pre-consumer (manufacturing process scrap) materials, or where they choose to locate their facilities. Because end markets are focused on meeting the demand for the products that they make, recycling is often a sideline of their businesses and a means of obtaining low-cost raw materials for manufacture.

It is not a requirement that end markets for all types and quantities of recycled materials that are collected and processed in Illinois be located in the state. This fact needs to be acknowledged when considering whether an end market barrier or deficiency exists. In fact, end markets for many recovered materials are national and international in scope – they consider many factors when deciding where to locate their product manufacturing sites, including freight costs (for delivery of their products to market as well as bringing in raw materials), utility costs, labor cost and skill level, tax incentives, etc. Care must be taken before attempting to create end-markets for recyclables to ensure that the products produced will be able to compete in the marketplace against the products produced by other in-state or out-of-state firms. It may be better to assist an existing in-state manufacturer convert its manufacturing systems to use recycled content, or even allow recovered materials to go to an out-of-state market, rather than introduce new excess manufacturing capacity into industries that are already be saturated.

This caveat does not imply that DCCA should take a hands-off approach to recycling market development in Illinois. In fact, recovery of recyclables in the state may be the enabling factor that allows the development of manufacturing industries in Illinois that otherwise would not be competitive if located in the state. Also, as resource substitution of recycled materials for virgin materials occurs, there will be a shift for some types of manufacturing from locations near virgin raw material production sites to areas where materials are recovered from the waste stream. Furthermore, not all recycled materials go into products of high-value or that are inexpensively transported. For those cases, freight costs can be an impediment that requires local recycling market development efforts if materials such as organics and construction and demolition debris are to be diverted for beneficial use.

In order to evaluate whether there is sufficient market demand for increases in recovery, R. W. Beck started by comparing existing and projected increases in the collection of

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<sup>28</sup> "Nonhazardous Solid Waste Management and Landfill Capacity in Illinois – 1999 Annual Report," Illinois Environmental Protection Agency, January 2001. Although the overall recycling rates reported in the report are thought to be inflated, conclusions can still be drawn from differences between relative recycling rates.

recyclables in Illinois to consumption of recovered materials by Illinois materials reclaimers and recycling manufacturing establishments. The following table shows ratios of Illinois material recovery to recovered material consumption by Illinois manufacturers for the major material groups based on data from Section 4 of this report.

**TABLE 6-1**  
**IN-STATE MARKET DEMAND FOR RECOVERED MATERIALS**

Material	Ratio of Illinois Collection to In-State Demand <sup>1</sup>
Glass	0.5
Paper	1.3
Nonferrous metals	0.3
Ferrous metals	0.2
Plastics	0.2

<sup>1</sup> A value greater than 1 means Illinois is a net exporter of that recovered material

With the exception of paper, Illinois manufacturers consume much more recycled materials than are collected in the state, suggesting that there is sufficient market demand for increases of most of the major materials. For paper, there is sufficient national and export demand. This is not the case, however, for other materials, such as compost, wood, electronics, and construction and demolition debris, and weak end market demand for those materials can be considered an impediment to increased diversion.

Many products are disposed rather than recycled because economical reclamation technologies are not commonplace, which is an obstacle – carpet recycling is an example of this phenomenon. Similarly, reclamation technologies sometimes produce a recycled product that is somehow different from the virgin material currently being utilized, which can be an impediment to marketing recycled materials to end product manufacturers that aren't familiar with or equipped to utilize the recycled raw materials.

Finally, apparently simple or nominal cost changes to manufacturing practices by new product manufacturers can result in products that are significantly more difficult or costly to recycle, or which require additional reclamation equipment. Examples include ways different materials are adhered together, or ways that coatings or colorants are incorporated. Changes in new product manufacturing processes can be an impediment to end markets for recovered products.

## 6.2 MECHANISMS FOR OVERCOMING BARRIERS AND IMPEDIMENTS

There are a variety of approaches that Illinois can take to overcoming the barriers and impediments to increased recycling that were identified in Section 6.1. This section describes some of the options that can be employed. It must be noted, however, that some of the obstacles that were previously identified are based on issues of cost or personal behavior. Our system of free enterprise, constitutional prohibition against the interference of interstate commerce, and international trade agreements all limit the regulatory role of government. As a result, some of the actions that will be needed to overcome barriers or impediments will be limited to incentives or assistance.

### 6.2.1 RECOVERY INFRASTRUCTURE

It was previously noted that the lack of universal convenient recyclables collection programs, particularly for residents of multifamily dwellings and at the workplace, was an obstacle to

increased recovery. Furthermore, achieving higher recycling rates will require the targeting of additional materials for higher levels of recovery, including yard waste, construction and demolition debris, residential mixed paper, and commercially-generated paper, metals, and other discards. Some of the strategies that can be utilized include:

- Raising community recycling goals;
- Passing ordinances for residential and business recycling programs;
- Implementing disposal bans on recyclable products;
- Increasing inspections and enforcement action for products banned from disposal facilities, including funding inspector positions;
- Providing grants or incentives/rewards to communities for increased diversion; and
- Conducting workshops to promote technology transfer, reduce collection costs, and learn from the successes of others.

### 6.2.2 BEHAVIOR

Several strategies can be implemented to increase participation in recycling programs and capture more targeted recyclables. These strategies include:

- Increasing inspections and enforcement action for products banned from disposal, including funding inspector positions;
- Transitioning to larger-sized recyclables collection containers;
- Promoting pay-as-you-throw so that cost-savings occur from increased recycling;
- Implementing deposits; and
- Promoting recycling through education and awareness programs.

### 6.2.3 ECONOMICS

Low costs for solid waste disposal can be an obstacle to increased recovery. In some jurisdictions, excess disposal capacity or facilities that are not appropriately sized to be cost-effective have been permitted and constructed. In order to meet bond covenants and pay the debt service on those facilities, some jurisdictions have subsidized part of the disposal cost through assessments or other funding mechanisms so that tipping fees are kept artificially low in order to preserve the flow of waste into the facilities. The need for revenue creates an economic disincentive to establishing recycling programs, particularly for commercial sector generators of solid waste. Several things can be done to address the economics of recycling compared to waste disposal, including:

- Establish recycling ordinances, which removes economics from the decision-making process;
- Carefully review permits for disposal and transfer facilities;
- Require disposal facilities to operate as enterprise funds;
- Place surcharges on tipping fees to raise the cost of waste disposal and provide a funding source for recycling.

Care must be taken when considering options for influencing the economics of recycling versus disposal to ensure that disposal costs aren't exorbitantly increased. Doing so could simply result in the transfer of waste out of Illinois to low-cost landfills located in neighboring states.



## 6.2.4 END MARKETS

End market impediments exist for organics, construction and demolition debris, and electronics. Furthermore, although there are not impediments for other materials that are commonly recycled in the state (e.g., ferrous metals, nonferrous metals, newspapers), there are opportunities for DCCA to promote the growth of in-state markets for those materials so that Illinois can benefit from the economic impact of those market areas. The following types of programs can be used to bolster end markets for recyclables:

- Grant and loan programs that are targeted to expanding markets, particularly for problematic materials;
- Environmentally preferable purchasing and buy recycled programs;
- Business assistance programs for recycling enterprises, including business plan development, technical assistance, marketing assistance, relocation assistance, and links to alternative sources of financing;
- Recycled product development assistance programs, such as grants, matching funds, or loans for product prototyping, testing, and equipment or process conversions; and
- Product stewardship and extended product responsibility, so that industry can more fully share in the management and costs of the recovery and recycling infrastructure, and directly benefit from design for recyclability and the environment.

## 6.3 SUMMARY OF POLICY AND PROGRAM COST, EFFECTIVENESS, AND BENEFITS

R. W. Beck reviewed published literature and contacted a number of states in an effort to obtain data on the cost and effectiveness of programs and policies in achieving statewide recycling/diversion rate goals. Much of the detailed and specific information that was available was for specific community-operated residential recycling programs and the diversion amounts from those programs rather than aggregate statewide figures.

### 6.3.1 LITERATURE REVIEW

#### 6.3.1.1 PUBLISHED STATEWIDE DATA

R. W. Beck conducted a review of published information looking for statewide aggregated cost and effectiveness information for state recycling and reuse programs. Table 6-2 below summarizes recycling/waste reduction rates for each U.S. state, compared to state recycling rate goals, residential recycling (curbside) access rates, and state recycling and composting grant and loan expenditures.

**TABLE 6-2**  
**STATE RECYCLING/WASTE REDUCTION RATES COMPARED TO MAJOR PROGRAM ELEMENTS**  
**(FY1999/2000)**

State	Recycling Rate Achieved	Recycling Rate Goal	Population Covered by Curbside (%)	State Grants (\$)	State Loans (\$)
Alabama	23	25	24	197,000	0
Alaska	7	N/A	0	N/A	N/A
Arizona	26	N/A	47	750,000	N/A
Arkansas	44	40	60	2,500,000	0
California	37	50	56	18,750,000	1,500,000

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State	Recycling Rate Achieved	Recycling Rate Goal	Population Covered by Curbside (%)	State Grants (\$)	State Loans (\$)
Colorado	N/A	N/A	N/A	N/A	N/A
Connecticut	24	40	100	0	0
Delaware	57	N/A	N/A	0	0
Florida	28	30	80	7,500,000	2,400,000
Georgia	N/A	25	76	800,000	90,000
Hawaii	28	50	0	0	0
Idaho	N/A	N/A	N/A	N/A	N/A
Illinois	27	25	66	<1,000,000	0
Indiana	32	50	39	1,200,000	2,100,000
Iowa	37	50	50	0	2,100,000
Kansas	12	N/A	63	1,300,000	0
Kentucky	33	N/A	N/A	0	0
Louisiana	17	25	N/A	N/A	N/A
Maine	42	50	35	30,000	0
Maryland	36	15	70	0	0
Massachusetts	38	46	78	15,000,000	600,000
Michigan	N/A	N/A	N/A	870,000	0
Minnesota	41	35	76	N/A	N/A
Mississippi	14	25	13	N/A	N/A
Missouri	36	40	40	6,500,000	N/A
Montana	11	25	N/A	0	0
Nebraska	29	50	32	4,000,000	0
Nevada	11	25	87	150,000	0
New Hampshire	24	40	36	N/A	N/A
New Jersey	40	65	90	3,943,000	0
New Mexico	10	50	34	N/A	N/A
New York	42	50	95	12,000,000	0
North Carolina	29	40	45	600,000	500,000
North Dakota	20	40	15	0	0
Ohio	20	25	N/A	4,500,000	0
Oklahoma	N/A	N/A	29	200,000	0
Oregon	30	50	56	267,000	0
Pennsylvania	33	35	90	35,317,000	1,000,000
Rhode Island	28	70	86	N/A	N/A
South Carolina	31	35	48	3,200,000	0
South Dakota	42	50	N/A	260,000	N/A
Tennessee	N/A	N/A	N/A	1,250,000	N/A
Texas	35	40	27	N/A	0
Utah	20	N/A	N/A	0	0
Vermont	35	50	54	150,000	0
Virginia	35	25	20	N/A	N/A
Washington	33	50	83	N/A	N/A
West Virginia	25	50	N/A	1,300,000	0
Wisconsin	40	N/A	60	24,500,000	2,300,000
Wyoming	N/A	N/A	0	0	0

Source: BioCycle Magazine, November 2000.

A comparison of the reported recycling/waste reduction rates in Table 6-2 to grant and loan funding on a per-capita basis did not show a strong correlation. There also was no strong correlation of statewide recycling rates to the extent to which curbside recycling collection access is provided, or percent of the state's population covered by unit-based pricing ("pay as you throw," or "PAYT") for residential waste disposal. It is noteworthy, however, that there was a significant correlation of recycling goal levels to achieved recycling rates. In reality, it is likely that many program and policy factors work together in determining the level of recycling activity that is achieved, including:

- Level of goals;
- Extent of grant and loan program funding;
- Waste disposal tipping fee levels;
- Access to recycling collection programs;
- Landfill bans; and
- Extent of non-governmentally sponsored recycling programs.

Furthermore, the recycling rates shown in Table 6-2 above are "as reported" by states and, in many cases, are not comparable because of differences in what is included as "recycled" (numerator) and "generated" (denominator). In some cases, a diversion rate is reported. For example, Wisconsin's figures include estimates of backyard composting and other on-site reduction activities. For these reasons, correlating portions of statewide recycling rates to specific program elements and allocating costs to those recycling rates could not be done from the above data.

The literature search did uncover a study that quantified the cost of achieving various recycling rates in California.<sup>29</sup> Conclusions of that study were:

- Achieving a diversion rate of 35 percent costs approximately \$5.30 per household per month; and
- Achieving a diversion rate of 50 percent costs approximately \$7.00 per household per month.

A limitation of the study is that it focused on cost data for community-sponsored recycling programs. While commercial sector recycling activities and California's bottle redemption program contribute to diversion rates, their cost or effectiveness data were not explicitly determined by the study. For this reason, the per-household data may be most useful as points of reference, or "reality checks," for this REI study.

### **6.3.1.2 PUBLISHED DATA FOR SPECIFIC PROGRAMS AND POLICIES**

In conducting the literature review useful information was found on the cost and effectiveness of individual programs and policies, suggesting that one option for estimating the costs of reaching certain recycling rates is to sum the individual cost and diversion impacts of a collection of program/policy options.

One national study surveyed a wide variety of communities in an attempt to correlate demographic and program data to recycling rates on the community level.<sup>30</sup> That study reached the following conclusions:

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<sup>29</sup> "Achieving 50% Recycling – What Will It Cost? How Can We Get There?", Skumatz Economic Research Associates Inc., October 1998.

<sup>30</sup> "Nationwide Diversion Rate Study: Quantitative Effects of Program Choices on Recycling and Green Waste Diversion: Beyond Case Studies" conducted by Skumatz Economic Research Associates Inc., October 1996.

- Implementing pay as you throw programs increases diversion by 8 to 11 percentage points;
- Providing curbside collection of residential recyclables accounts for 6 to 9 percentage points of diversion;
- Collecting yard waste curbside accounts for 4 to 5 percentage points of diversion;
- Making yard waste collection mandatory (disposal bans) adds another 4 to 5 percentage points of diversion; and
- Providing drop-off collection of recyclables adds 3 to 4 percentage points of diversion.

Additionally, a similar study by the same author analyzed California community data and concluded:<sup>31</sup>

- Expanding collection programs to multifamily residences adds 1 to 2 percentage points of diversion; and
- Adding materials (such as residential mixed paper) adds 3 to 5 percentage points of diversion.

It should be noted that the above results represent marginal changes for each program item, meaning that the results predict projected increases in diversion rates as a result of making changes to each specific program item separately.

The cost of operating a PAYT program varies, and is largely dependent on the type of program (e.g., bag, sticker, can). For this study, the net cost of implementing and operating PAYT programs in Illinois was assumed to be zero based on data from two studies in Wisconsin and Iowa.<sup>32</sup> Data from those studies were assumed to apply to Illinois due to regional similarities among the states.

Data for collection and processing costs associated with electronics diversion programs is limited because comprehensive large-scale programs have only recently begun. Because these types of programs are driven more by concerns over the hazardous nature of certain electronics components, they tend to resemble household hazardous waste collection programs (in terms of program cost and diversion mechanisms) rather than traditional municipal recycling programs. Data of use to this study was drawn from two studies, one in Minnesota and one in Massachusetts.<sup>33</sup> Those studies indicated that typical collection costs for recovered electronics were \$240 to \$300 per ton, and processing was approximately \$100 per ton. However the studies noted that pilot program and start-up costs had resulted in inflated costs compared to what would be expected of mature ongoing programs.

### 6.3.2 STATE SURVEY RESULTS

In addition to reviewing published data, R. W. Beck surveyed several leading states for cost-effectiveness data of various programs or policies. R. W. Beck considered various criteria when selecting states for the data gathering effort. More specifically, states were selected for the study based on their having:

- Recycling/waste reduction goals;

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<sup>31</sup> "Achieving 50% Recycling – What Will It Cost? How Can We Get There?", Skumatz Economic Research Associates Inc., October 1998.

<sup>32</sup> "Pay as you Waste: State of Iowa Implementation Guide for Unit-Based Pricing," Iowa Department of Natural Resources, 1997; and "Wisconsin Volume Based Rate Collection Guide," University of Wisconsin Extension, 1993.

<sup>33</sup> "Minnesota's Multi-Stakeholder Approach to Managing Electronic Products at End-of-Life," Minnesota Office of Environmental Assistance, 2000; and "Electronics Re-Use and Recycling Infrastructure Development in Massachusetts," United States Environmental Protection Agency Region 1, 2000.

- High recycling/waste diversion rates (i.e., 30 percent or more);
- Significant state programs supporting recycling and reuse; and
- Possibly evaluated the effectiveness of their respective recycling/waste reduction grant and loan programs.

Based on these criteria, fifteen states stood out from the rest and were selected by R. W. Beck for further investigation. These states were:

Arkansas	Massachusetts	Oregon
California	Minnesota	Pennsylvania
Florida	Nebraska	Vermont
Indiana	New Jersey	Washington
Maine	New York	Wisconsin

Of the fifteen states targeted, the ten states listed below completed the survey:

Arkansas	California
Florida	Indiana
Massachusetts	Nebraska
Oregon	Pennsylvania
Washington	Wisconsin

New York declined to participate because they were attending to more pressing matters associated with the September 11, 2001 terrorism disaster. Maine, Minnesota, Rhode Island, and Vermont did not respond to several survey attempts.

Table 6-3 below summarizes information regarding state grant and loan funding levels, qualifying establishments, basis of awards, and required match for those states that responded to the survey.

**TABLE 6-3**  
**SUMMARY OF STATE RECYCLING AND SOLID WASTE PLANNING GRANT AND LOAN PROGRAMS**

State	Funding \$Millions	Counties	Municipalities	Non-Profits	For-Profit	Basis	Match Applicant:State
Arkansas	2.5 G	G	G			competitive – regional boards	varies by proposer
California	10.0 G 3.0 L	G	G		L	varies by program location, impact	varies by program 75:25
Florida	7.5 G 2.4 L	G			L	county population < 100,000 small businesses	none min. 10:90
Indiana	0.4 G 5.5 L	G	G	G	L	program start-up/expansion job creation/diversion amount	50:50 50:50
Massachusetts	15.0 G 4.0 L		G	G L	G L	diversion/competitive	comp. is need/results varies by proposer
Nebraska	4.0 G	G	G	G	G	competitive	varies by proposer
Oregon	0.3 G	G	G			competitive	varies by proposer
Pennsylvania	38.0 G 1.0 L	G	G		L	diversion/reimbursement competitive	reimb. is 10:90 50:50
Washington	5.1 G	G				population/reimbursement	25:75
Wisconsin	14.5 G 2.3 L	G	G		L	population/reimbursement competitive	~70:30 25:75

Key: G=grant L=loan

States responding to the survey had a wide variety of solid waste management grant and loan programs, each set up differently relative to who qualifies, whether grants are competitive, and whether a financial match is required. In conducting the survey we found that the types of grants provided by responding states differed considerably from state-to-state. However, virtually all states have grant programs for waste tires, used oil, or household hazardous waste, and similar grant programs could be set up for special wastes such as electronics.

The survey revealed that no state that was contacted adequately measured grant program cost-effectiveness. Many states had never formally attempted to measure the effectiveness of their grant programs. Moreover, most had not created standardized forms to facilitate numerical tracking. Those who had gathered data primarily focused their forms on fiscal reporting for project expense reimbursement purposes.

Several states cited reasons for not being able to identify or rigorously track grant/loan program cost-effectiveness. These reasons included:

- Difficulties in measuring impacts associated with public education and promotion projects for recycling and waste reduction;
- One-time grant expenditures for infrastructure development have ongoing recovery impacts, necessitating a complex lifecycle approach to evaluating cost-effectiveness;
- Differences between grants that have a cost because they aren't repaid and loans that can be considered to be "no cost" because they are repaid, even though both have diversion impacts; and
- Undefined benefits experienced by other communities throughout the state from research, innovation, and demonstration projects that were funded at one location.

Nebraska and Wisconsin were two states that had recently undertaken specific examinations of the effectiveness of their grant programs. The following is a brief overview of Nebraska's and Wisconsin's recycling grant/loan program evaluation efforts.

### 6.3.2.1 STATE OF NEBRASKA GRANT/LOAN PROGRAM EVALUATION EFFORTS

Nebraska commissioned a study to evaluate the cost-effectiveness of its grant and loan programs. That study concluded that,

*"Information on the impacts of [Nebraska Environmental Trust's and Department of Environmental Quality's] grant projects funded to date is incomplete and/or not readily available...only limited information was available on the quantities and composition of materials diverted as a direct result of individual grant projects."*

As a result, Nebraska's study focused on organizing grant data into a database, analyzing the types of projects funded, quantifying increased diversion (on a statewide basis) over the period of the grant program. The study also provided a methodology for quantifying the economic and environmental benefits of recycling and source reduction, including:

- Economic benefits for recycling and source reduction based on per-ton commodity values (recycling) and per-ton purchase cost savings (source reduction);
- Landfill space savings in cubic feet resulting from recycling and source reduction efforts funded by grants and loans;
- Forest acreage saved due to recycling and source reduction;
- BTUs of energy saved due to recycling and source reduction;
- Tons of emissions savings (atmospheric, waste, and water-borne) from recycling and reuse; and

- Avoided greenhouse gases in metric tons of carbon equivalent resulting from recovery and source reduction.

Economic benefits for landfill space savings, forest acreage savings, energy, emissions, and greenhouse gas reduction are subject to widespread debate and were not quantified.

#### 6.3.2.2 STATE OF WISCONSIN GRANT/LOAN PROGRAM EVALUATION EFFORTS

Wisconsin attributes its most significant gains in its statewide recycling rate to its 1995 landfill ban on certain recyclables commonly targeted by local community recycling programs. In conjunction with this ban, Wisconsin has been providing grant funds to local governments to support their recycling program efforts. The apparent disparity in cost-effectiveness among local government programs led Wisconsin's legislature to task the State's Department of Natural Resources to "conduct a study of the future of solid waste management, including an examination of ways to increase the efficiency and effectiveness of current recycling programs." Grant funding of recycling in Wisconsin is currently set to expire at the end of fiscal year 2004 unless a new system of funding is established.

The Department of Natural Resources tracks grant expenditures and municipal diversion amounts associated with such grants. However, in its January 2001 report "A Study of the Future of Solid Waste Management: A Report to the Wisconsin Legislature" it stated that:

*"Strong, clear relationships could not be established between solid waste cost per ton and recycling costs per ton, recycling rate and population or number of households served, recycling rate and cost per ton for recycling, tons recycled and cost per ton; or the percent DNR funding and the recycling rate."*

Wisconsin's report does, however, reference statewide disposal costs of \$85 per ton (collection, hauling, and tipping fees combined) compared to average recycling costs of \$95 per ton incurred by Wisconsin communities. Furthermore, it goes on to state that these figures do not account for materials that communities no longer have to collect (e.g., 290,000 tons of yard waste that's managed at home) or the economic value of jobs created through recycling, the significant value of resources saved, or pollution prevented and energy saved efforts. Like Nebraska, Wisconsin quantified "quality of life impacts" by including cubic yards of landfill space saved, Wisconsin jobs in recycling, energy savings, greenhouse gas emissions savings, and air pollutant reductions.

#### 6.3.2.3 STATE GRANT/LOAN PROGRAM EVALUATION EFFORTS

In the absence of comprehensive cost-effectiveness data, a review was conducted of states that compare total grant spending over a specific period of time with commensurate increases in statewide recycling diversion over the baseline. Nebraska made use of this type of a statewide analysis in its grant program evaluation after grant recipient interviews performed by a consultant indicated that grant funding has been a catalyst for spurring growth in collection, processing, and end-use of recycled commodities. R. W. Beck also performed this type of an analysis from data supplied by other states, the results of which revealed the following:

- Florida expended \$186 million in Recycling and Education grants from 1990 through 1998. Over that same period an incremental 30 million tons of recovery occurred (including yard waste and construction and demolition debris), equaling \$6.21 of state funds spent per ton recovered. Local funds averaged \$5 for every \$1 of state funds over this period.
- Nebraska expended \$30.7 million in total grants from 1992 through 1998 (\$9.2 million went for hazardous waste, litter, tire clean-up, waste reduction). Over that same period an incremental 962,500 tons were recycled over the baseline amount. If only recycling spending is counted (i.e., \$22.5 million) this translates to \$23 of state money spent per

ton recovered (Nebraska's figures don't include construction and demolition debris recycling or composting). Grant matching funds and local program spending was not available for this analysis.

- Pennsylvania expended \$250 million in grants from 1989 through 1999. Over that same period an incremental 16.4 million tons were recycled over the baseline amount, equaling \$15.23 of state funds per ton recovered. Although information on local program expenditures were not available, most grant funding was provided through Pennsylvania's Recycling Grants, which are based on 90 percent reimbursement with money available for program initiation, expansion, and public education. Significant levels of grants were also awarded under an incentive grant program that is tonnage and recycling rate based, which pays from approximately \$5 to \$22 per ton recovered.
- Wisconsin expended \$24 million in grants during 1999, resulting in 0.9 million incremental tons recycled over 1990 levels. This equals \$26.67 of state money spent per ton recovered. These grants covered 30 percent of local government eligible recycling and yard waste costs. It should be noted that these cost per ton figures do not take into account future diversion likely to occur as a result of grant and loan program investment.

#### 6.3.2.4 IMPACTS OF GRANT/LOAN DISCONTINUATION

One way to measure the impact of grant funding is to examine what happens when grant funds are withdrawn. Table 6-4 illustrates the resulting impacts from New Jersey's and Washington's decisions to discontinue the distribution of recycling loans and grants. New Jersey's legislature cut off all solid waste and recycling grant fund appropriations after the state's "Recycling Tax" expired on December 31, 1996. Similarly, funding for Washington's Solid Waste Management Account expired in July 1995, and appropriations from that fund ceased. However, some grant funds still remain in Washington and come out of its Toxics Control Account.

**TABLE 6-4**  
**STATE RECYCLING RATES**

Year	New Jersey		Washington
	% of Total Tons	% of MSW Tons	% of MSW Tons
1985 <sup>1</sup>	8	9	N/A
1986 <sup>1</sup>	10	12	15
1987 <sup>1</sup>	15	18	23
1988 <sup>2</sup>	39	23	29
1989 <sup>2</sup>	43	30	28
1990 <sup>2</sup>	46	34	34
1991 <sup>2</sup>	50	39	33
1992 <sup>3</sup>	48	42	35
1993 <sup>3</sup>	53	40	38
1994 <sup>4</sup>	56	42	38
1995 <sup>4</sup>	60	45	39
1996 <sup>5</sup>	61	42	39
1997 <sup>5</sup>	61	43	33
1998 <sup>6</sup>	56	40	34
1999 <sup>6</sup>	55	39	33

Notes:

1) Final statistics from 1985 through 1987 derived from O&D and tonnage grant figures reported to the Department.

2) Final statistics from 1988 through 1991 derived from O&D and tonnage grant reported figures as supplemented by industry survey information for junked autos, asphalt, concrete, heavy iron, tires and batteries.



- 3) Final statistics derived from O&D and tonnage grant reported figures and supplemented only by add-ons from the NJDOT.
- 4) Beginning with the 1994 recycling reporting period, industry documented tonnage's for other aluminum scrap, other non-ferrous scrap, white goods and sheet iron, junked autos and heavy iron form the basis for the final tonnage's in these material categories. In addition, for 1995, additional recycling tonnage's not reported by the municipalities were added to the total recycling tonnage's.
- 5) Recycling tonnage's for 1996 and 1997 do not include material from the 62 and 45 municipalities respectively which did not report those years.
- 6) Recycling tonnages for 1998 and 1999 do not include material from the 47 and 15 municipalities respectively, which did not report those years.

Sources: NJ Department of Environmental Protection, Washington Department of Ecology

As shown in Table 6-4, recycling rates in both New Jersey and Washington declined by approximately five to six percent within three years of the discontinuation of recycling grant programs. Not all of the decline in recycling rates can be attributed to elimination or cuts in grant programs – Washington specifically noted that after it cut its grants commodity price declines resulted in less private sector recycling activity, which prevented a true determination of the cost-effectiveness of its grant programs. Similar statements can be made about New Jersey's data.

### **6.3.2.5 TYING GRANTS TO PERFORMANCE – REWARDING EFFECTIVE PROGRAMS**

Rather than simply distributing entitlement grants, Massachusetts and Pennsylvania reward municipalities for specific recycling achievements through incentive or performance grant programs that are based on tons of designated recyclables that are diverted (yard waste and construction and demolition debris are not designated materials in either state). These performance-based programs are in addition to other solid waste and recycling grant programs offered by each state. Furthermore, increases in recycling amounts or rates result in a greater dollar grant award. As a result, condition for receiving these performance grants is that communities must report the amounts of materials diverted in their respective jurisdictions. The State of Illinois may wish to consider developing a similar reporting system or incentive-based recycling grant/loan program to improve the State's specific data needs for measuring progress toward recycling goals.

For communities to participate in Massachusetts' Municipal Recycling Incentive Program (MRIP), they must meet certain criteria that include:

- Buying recycled products and tracking those purchases;
- Showing recycling program progress;
- Providing for household waste collection; and
- Having waste reduction programs.

Massachusetts also offers a "basic tier" MRIP as well as an "advanced tier" MRIP (with more stringent requirements). Payments under the basic tier are \$5 per ton for curbside recycling programs and \$3 per ton for drop-off programs. Payments under the advanced tier are \$10 per ton for curbside programs and \$6 per ton for drop-off programs. Either program pays a "bonus" of \$20 per ton for year-over-year tonnage increases. During the first three years of the MRIP program, payments to participating municipalities totaled nearly \$7 million (approximately \$0.65 per person per year), and residential recyclables tonnages increased by 20 percent.

Any municipality or county can participate in Pennsylvania's Performance Grant Program. Recovered materials must be source separated, and payment is only made for material that is marketed (after residue disposal). Payments include a base reward of \$5 per ton, where the number of commercial tons counted is limited to the number of tons recovered through government programs. Bonus payments are made by multiplying the municipality's recycling rate times \$1 per ton times the number of tons qualifying for the base reward.

Finally, as an incentive for communities to support private sector recovery programs, the program pays an additional \$10 per ton for private tons that exceed the public sector tons. In fiscal year 1999/2000, this specific performance grant program represented 40 percent of recycling grants paid, and amounted to \$1.21 per person.

### 6.3.3 CONCLUSIONS

Based on the literature search and survey results, it is difficult to determine a dollars per ton cost-effectiveness measure for specific state grant and loan programs, education and awareness programs, or state policies. In fact, it may be impossible for a variety of reasons, including the ongoing nature of programs after initial investments are made and the role that the private sector plays in providing solid waste and recycling collection services to the commercial sector, which significantly affects a state's overall recycling rate. Despite these limitations, R. W. Beck was able to use specific program-based data from the literature search and survey, in combination with other R. W. Beck planning factors, in order to arrive at growth scenario cost and effectiveness estimates found in the remainder of this report. Information used from the literature search/survey includes:

- Implementing PAYT programs can be expected to increase diversion by ten percent with no net program cost increases; and
- Collection costs for electronics recycling programs average \$180 per ton (assumes a one-third discount from average published costs due to program startup costs reflected in those totals), and processing costs average \$100 per ton.

Furthermore, statewide aggregate dollars per ton or dollars per person figures as reported in this section served as reality checks against which totals from each scenario were checked.

## 6.4 GROWTH SCENARIOS

The following three specific industry growth scenarios were analyzed for this study:

- Achieving a 35 percent state recycling rate;
- Achieving a 50 percent state recycling rate; and
- Banning the disposal of electronics in Illinois landfills.

In order to estimate economic impacts and scenario costs and benefits, it was necessary to make certain assumptions regarding the policies and programs that would be implemented, increases in diversion of various materials, and whether collected materials would be retained in state for reclamation/recycled product manufacturing.

Generally speaking, it was assumed that local collection/processing infrastructures and their costs/benefits will increase linearly with the growth in recycling rate. Assumptions for recycling manufacturing were more involved and required an evaluation of whether the additional materials collected were likely to displace virgin or imported recovered materials, or whether there were opportunities for manufacturing industry growth (using recovered materials) in Illinois. Specific assumptions are spelled out under each scenario.

### 6.4.1 AN INCREASE IN THE OVERALL RECYCLING RATE TO 35 PERCENT

#### 6.4.1.1 GROWTH SCENARIO PROGRAM ELEMENTS AND ASSUMPTIONS

The State of Illinois reached a 23 percent recycling rate in 1998, which subsequently grew to 27 percent in 1999 according to the Illinois Environmental Protection Agency. This growth

scenario is based on continuing the diversion trend until a recycling rate of 35 percent is achieved.

Assumptions for achieving 35 percent generally include bolstering the effectiveness of recovery programs already in place, expanding residential recyclables collection, and increasing commercial diversion. Specific program elements for the State to implement include:

- Increase county recycling goals to 35 percent;
- Increase the waste disposal tipping fee surcharge by \$0.60 per ton; and
- Promote recycling and work for development of markets, particularly for materials such as construction and demolition debris.

Specific program elements for local governments to implement include:

- Increase pay as you throw programs in Illinois from the current coverage of one million residents<sup>34</sup> to four million residents (in communities offering curbside collection of recyclables);
- Increase single-family curbside recycling collection access by one million residents (from 84 percent to 91 percent of single-family households);
- Increase multifamily on-site recycling collection access by 950,000 residents (from the current 22 percent to 50 percent of residences);
- Increase enforcement of the yard waste disposal ban that is already in affect though continued emphasis, inspections for compliance, and fines for collectors/generators who fail to comply – specifically, hire 50 inspectors to perform these activities;
- Increase residential mixed paper collection from an estimated two million residents in 1998 to four million residents;
- Promote additional construction and demolition debris processing for recovery;
- Promote additional commercial recycling programs through ordinances, waste audits, and incentives; and
- Increase recycling education and awareness programs by spending an additional \$0.50 per person.

It is assumed that implementing these program elements will result in an overall statewide recycling rate of 35 percent.

### 6.4.1.2 ECONOMIC IMPACTS

Table 6-5 shows the estimated economic impacts of achieving a 35 percent recycling rate, including offsets from economic activity that is lost in other sectors of the Illinois economy, such as waste collection, landfills, and rock quarries.

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<sup>34</sup> “Unit Based Pricing in the United States: A Tally of Communities,” M.L. Miranda, Duke University, 1999.

**TABLE 6-5**  
**ECONOMIC IMPACT OF ACHIEVING A 35 PERCENT RECYCLING RATE**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
Recycling Industry Economic Activity								
1. Government Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	691	(256)		435	17	163	615
	Annual Payroll	24,020	(8,998)		15,023	712	5,661	21,395
	Estimated Receipts	48,926	(38,093)		10,833	696	5,313	16,841
	Estimated Throughput	491			491			
2. Private Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	1,229	(340)		889	78	405	1,372
	Annual Payroll	42,703	(11,927)		30,776	2,717	12,054	45,547
	Estimated Receipts	85,969	(50,495)		35,474	4,680	21,228	61,382
	Estimated Throughput	3,244			3,244			
3. Compost and Miscellaneous Organics Producers	Establishments	30	0	landfills	30			
	Employment	569	(68)		501	185	193	879
	Annual Payroll	10,312	(2,683)		7,630	4,971	4,554	17,154
	Estimated Receipts	47,252	(19,001)		28,251	12,780	12,077	53,108
	Estimated Throughput	587			587			
4. Materials Recovery Facilities (MRF's)	Establishments	14	0	landfills	14			
	Employment	1,280	(44)		1,236	563	524	2,323
	Annual Payroll	22,818	(1,712)		21,107	18,364	14,205	53,676
	Estimated Receipts	80,915	(12,124)		68,792	33,984	25,224	127,999
	Estimated Throughput	375			375			
5. Recyclable Material Wholesalers	Establishments	60	0	landfills	60			
	Employment	5,213	(1,769)	waste collection	3,443	1,531	2,484	7,458
	Annual Payroll	166,454	(63,485)		102,970	34,638	49,528	187,135
	Estimated Receipts	2,564,233	(304,888)		2,259,346	698,610	1,107,563	4,065,518
	Estimated Throughput	2,773			2,773			
6. Glass Container Manufacturing Plants	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	39			39			
7. Glass Product Producers (other recycled uses)	Establishments	1	(1)	fiberglass	0			
	Employment	58	(58)	sand blast and	0	0	0	0
	Annual Payroll	1,238	(1,238)	filter media	0	0	0	0
	Estimated Receipts	5,014	(5,014)		0	0	0	0
	Estimated Throughput	10			10			

## FUTURE GROWTH SCENARIOS

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	1	0	none	1			
	Employment	231	0		231	460	357	1,048
	Annual Payroll	9,352	0		9,352	19,332	10,678	39,361
	Estimated Receipts	139,415	0		139,415	58,000	29,346	226,761
	Estimated Throughput	33			33			
9. Nonferrous Product Producers	Establishments	1	0	none	1			
	Employment	106	0		106	128	113	347
	Annual Payroll	4,375	0		4,375	5,595	3,618	13,588
	Estimated Receipts	32,604	0		32,604	17,878	9,937	60,419
	Estimated Throughput	17			17			
10. Nonferrous Foundries	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	7			7			
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	3	0	none	3			
	Employment	423	0		423	377	381	1,182
	Annual Payroll	19,635	0		19,635	16,613	13,145	49,393
	Estimated Receipts	116,385	0		116,385	48,362	34,662	199,409
	Estimated Throughput	353			353			
12. Paper-Based Product Manufacturers	Establishments	3	0	none	3			
	Employment	121	0		121	85	95	301
	Annual Payroll	5,332	0		5,332	3,774	3,300	12,407
	Estimated Receipts	26,662	0		26,662	10,693	8,673	46,028
	Estimated Throughput	54			54			
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	2	(2)	rock quarries	0			
	Employment	(D)	(D)		0	0	0	0
	Annual Payroll	(D)	(D)		0	0	0	0
	Estimated Receipts	(D)	(D)		0	0	0	0
	Estimated Throughput	(D)			0			
14. Plastics Reclaimers	Establishments	0	0	none	0			
	Employment	47	0		47	30	28	105
	Annual Payroll	1,378	0		1,378	1,229	942	3,550
	Estimated Receipts	3,942	0		3,942	1,962	1,441	7,346
	Estimated Throughput	7			7			
15. Plastics Converters	Establishments	1	0	none	1			
	Employment	124	0		124	80	75	279
	Annual Payroll	3,810	0		3,810	3,398	2,605	9,813
	Estimated Receipts	19,764	0		19,764	9,838	7,227	36,829
	Estimated Throughput	2			2			

## SECTION 6

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
16. Rubber Product Manufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
17. Steel Mills	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	501			501			
18. Iron and Steel Foundries	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	43			43			
19. Other Recycling Processors/Manufacturers	Establishments	6	0	various	6			
	Employment	142	(71)		71	32	30	134
	Annual Payroll	2,971	(1,485)		1,485	1,292	1,000	3,777
	Estimated Receipts	31,684	(15,842)		15,842	7,826	5,809	29,477
	Estimated Throughput	157			157			
Recycling Industry Subtotal	Establishments	122	(3)		119			
	Employment	10,233	(2,606)		7,627	3,567	4,848	16,042
	Annual Payroll (\$1,000)	314,400	(91,527)		222,873	112,635	121,289	456,796
	Estimated Receipts (\$1,000)	3,202,765	(445,457)		2,757,308	905,309	1,268,501	4,931,119

Reuse and Remanufacturing Industry Economic Activity								
20. Computer & Electronic Appliance Demanufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
21. Motor Vehicle Parts (used)	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							

## FUTURE GROWTH SCENARIOS

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
22. Retail Used Merchandise Sales	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
23. Tire Retreaders	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
24. Wood Reuse	Establishments	2	0	pallet makers	2			
	Employment	39	(39)	lumberyards	0	0	0	0
	Annual Payroll	893	(893)		0	0	0	0
	Estimated Receipts	3,257	(3,257)		0	0	0	0
	Estimated Throughput							
25. Materials Exchange Services	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
26. Other Reuse	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
Reuse Industry Subtotals	Establishments	2	0		2			
	Employment	0	0		0	0	0	0
	Annual Payroll (\$1,000)	0	0		0	0	0	0
	Estimated Receipts (\$1,000)	0	0		0	0	0	0

GRAND TOTALS	Establishments	124	(3)		121			
Recycling and Reuse/Remanufacturing	Employment	10,272	(2,645)		7,627	3,567	4,848	16,042
	Annual Payroll (\$1,000)	315,293	(92,421)		222,873	112,635	121,289	456,796
	Estimated Receipts (\$1,000)	3,206,022	(448,714)		2,757,308	905,309	1,268,501	4,931,119

In reviewing the information in Table 6-5, it must be noted that substitution of recovered materials for virgin materials at existing Illinois manufacturers generally doesn't produce additional direct economic activity (i.e., new jobs, additional revenues, etc.). In order for economic growth to occur, either new establishments must open or existing establishments must increase their production and product sales. Because Illinois has end market demand that outstrips in-state supply for many materials (as shown in Table 6-4) it was assumed that materials substitution of Illinois recovered material for imported recovered material would occur in most recycling manufacturing instances. Therefore, most of the increases in economic activity were estimated to occur in local collection and processing. However, it was assumed that opportunities exist to expand recycling manufacturing in Illinois for a few select areas. Those assumptions include:

- Expansion of secondary smelting of nonferrous metals through production increases at existing smelters and the addition of one new establishment;
- One virgin-metal nonferrous product producer converts to using recovered material;
- Three new paper/paperboard mills open in the state – one newsprint and two paperboard/linerboard mills;
- Three new other paper products manufacturers open plants in the state;
- Plastics reclaimers already in Illinois expand their production;
- One virgin plastic converter shifts production to use recycled plastics; and
- Six new establishments open to recycle a variety of other recovered materials.

### 6.4.1.3 COSTS AND BENEFITS

As was discussed in Section 6.3 there was no strong correlation of state government grant and loan spending levels and statewide recycling rates – much of the costs associated with specific recycling programs are borne by local governments and the private sector. However, most people agree that state governments need to provide some measure of support beyond policy-making so that recycling rates increase, at a minimum funding research and demonstration projects, providing technical resources (including workshops, market guides, assistance visits, or training sessions), and providing direct assistance to develop markets. Because there is disagreement on the level of state support that is necessary to achieve higher recycling rates, it was assumed for the purposes of this analysis that a level of five percent of net program costs would be sufficient. This level of funding is within the range of state spending that was reported in Table 6-1 for those states that do not significantly subsidize local recycling programs with state funds.

Estimating local government costs are more straightforward because cost information on specific types of diversion programs is more readily available. In the cost analysis for achieving a 35 percent recycling rate, local government program costs were estimated for each of the program changes listed in Section 6.4.1.1 and adjusted for disposal cost savings at the statewide average tipping fee level (\$30 per ton) so that net cost figures were produced. Because similar information was not found for private sector diversion programs, it was assumed that incremental private sector costs were an additional \$5 for every ton diverted from disposal.

There are many benefits to recycling, including:

- Disposal tip fee cost savings;
- Job creation and resulting tax revenues that flow to governments;
- Extending landfill life;



- Energy savings;
- Greenhouse gas reduction;
- Atmospheric and waterborne emissions reductions; and
- Resource conservation.

In this study R. W. Beck quantified the economic benefits of the first two items listed above. However, assigning economic benefits to the remaining items is exceedingly complex and was beyond the scope of this study; therefore their economic effects are not included in the cost and benefit analysis of this section.

Table 6-6 lists the results of the cost and benefits analysis for achieving a 35 percent recycling rate:

**TABLE 6-6**  
**COST-BENEFIT COMPARISON OF ACHIEVING A 35 PERCENT RECYCLING RATE**

ALL VALUES ARE IN ARE IN \$MILLIONS

	Government		Commercial Sector	Total
	State	Local		
Costs				
Net Additional Cost to Achieve 35% <sup>1</sup>	2	24	18	44
Benefits				
Recycling and Reuse Industry Tax Payments	17	16	0	33
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	43	41	0	84

<sup>1</sup> Net of avoided disposal cost savings.

<sup>2</sup> Included taxes from indirect and induced economic activity stimulated by the recycling and reuse industry.

In reviewing the information provided in Table 6-6, it should be noted that revenues associated with increasing the state tipping fee surcharge by \$0.60 per ton are not included in the analysis because they are derived from waste disposal and are not recycling program costs or benefits. The revenues associated with the increased tipping fee surcharge are estimated to amount to \$8 million per year, and can be used to offset the additional costs to achieve a 35 percent recycling rate. It should also be noted that all fiscal estimates are based on information available at the time this study was completed. No assumptions have been made for the time it may take to achieve this or the other growth scenarios, or the affects of inflation over time.

## 6.4.2 AN INCREASE IN THE OVERALL RECYCLING RATE TO 50 PERCENT

### 6.4.2.1 GROWTH SCENARIO PROGRAM ELEMENTS AND ASSUMPTIONS

This growth scenario is based on achieving a recycling rate of 50 percent. Assumptions for achieving 50 percent generally include bolstering the effectiveness of recovery programs already in place, expanding residential recyclables collection, and increasing commercial diversion, particularly for paper, metals, and construction and demolition debris. The specific program elements mentioned below are changes from current recovery systems, and therefore are in place of and not additional to the program elements discussed under the 35 percent scenario. Specific program elements for the State to implement include:

- Increase county recycling goals to 50 percent;
- Require recycling programs for paper and metals at commercial establishments;

- Require that construction and demolition debris be processed for recovery prior to disposal;
- Consider mandating that counties over 100,000 population must provide universal curbside/on-site residential recycling collection programs;
- Increase the waste disposal tipping fee surcharge by \$1.20 per ton; and
- Promote recycling and work for development of markets, particularly for materials such as construction and demolition debris.

Specific program elements for local governments to implement include:

- Increase pay as you throw programs in Illinois from the current coverage of one million residents<sup>35</sup> to six million residents (in communities offering curbside collection of recyclables);
- Increase single-family curbside recycling collection access by one million residents (from 84 percent to 91 percent of single-family households);
- Increase multifamily on-site recycling collection access by 1,800,000 residents (from the current 22 percent to 75 percent of residences);
- Increase residential mixed paper collection from an estimated two million residents in 1998 to eight million residents;
- Strictly enforce the yard waste disposal ban that is already in affect though continued emphasis, inspections for compliance, and fines for collectors/generators who fail to comply – specifically, hire 100 inspectors to perform these activities;
- Require that all construction and demolition debris be processed for recovery prior to disposal;
- Require commercial recycling programs through ordinances and provide implementation assistance through waste audits and workshops; and
- Increase recycling education and awareness programs by spending an additional \$1.00 per person.

It is assumed that implementing these program elements will result in an overall statewide recycling rate of 50 percent.

### 6.4.2.2 ECONOMIC IMPACTS

Table 6-7 shows the estimated economic impacts of achieving a 50 percent recycling rate, including offsets from economic activity that is lost in other sectors of the Illinois economy, such as waste collection, landfills, and rock quarries.

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<sup>35</sup> “Unit Based Pricing in the United States: A Tally of Communities,” M.L. Miranda, Duke University, 1999.

**TABLE 6-7**  
**ECONOMIC IMPACT OF ACHIEVING A 50 PERCENT RECYCLING RATE**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
Recycling Industry Economic Activity								
1. Government Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	908	(337)		572	22	214	808
	Annual Payroll	31,566	(11,824)		19,742	936	7,439	28,116
	Estimated Receipts	64,295	(50,059)		14,236	914	6,982	22,132
	Estimated Throughput	645			645			
2. Private Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	1,615	(446)		1,168	102	532	1,803
	Annual Payroll	56,117	(15,674)		40,443	3,571	15,841	59,855
	Estimated Receipts	112,975	(66,358)		46,617	6,150	27,897	80,664
	Estimated Throughput	6,216			6,216			
3. Compost and Miscellaneous Organics Producers	Establishments	60	0	landfills	60			
	Employment	894	(107)		786	291	303	1,380
	Annual Payroll	16,198	(4,214)		11,984	7,807	7,152	26,944
	Estimated Receipts	74,219	(29,845)		44,374	20,074	18,969	83,417
	Estimated Throughput	922			922			
4. Materials Recovery Facilities (MRF's)	Establishments	28	0	landfills	28			
	Employment	1,653	(56)		1,597	728	677	3,002
	Annual Payroll	29,484	(2,212)		27,273	23,728	18,355	69,356
	Estimated Receipts	104,553	(15,665)		88,888	43,911	32,593	165,392
	Estimated Throughput	484			484			
5. Recyclable Material Wholesalers	Establishments	200	0	landfills	200			
	Employment	10,253	(3,480)	waste collection	6,773	3,010	4,887	14,670
	Annual Payroll	327,394	(124,866)		202,528	68,128	97,414	368,070
	Estimated Receipts	5,043,517	(599,675)		4,443,842	1,374,076	2,178,434	7,996,352
	Estimated Throughput	5,455			5,455			
6. Glass Container Manufacturing Plants	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	69			69			
7. Glass Product Producers (other recycled uses)	Establishments	2	(2)	fiberglass	0			
	Employment	116	(116)	sand blast and	0	0	0	0
	Annual Payroll	2,477	(2,477)	filter media	0	0	0	0
	Estimated Receipts	10,028	(10,028)		0	0	0	0
	Estimated Throughput	17			17			

## SECTION 6

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	2	0	none	2			
	Employment	271	0		271	541	420	1,233
	Annual Payroll	11,004	0		11,004	22,748	12,565	46,317
	Estimated Receipts	164,053	0		164,053	68,250	34,532	266,835
	Estimated Throughput	39			39			
9. Nonferrous Product Producers	Establishments	1	0	none	1			
	Employment	124	0		124	151	132	408
	Annual Payroll	5,149	0		5,149	6,584	4,257	15,989
	Estimated Receipts	38,365	0		38,365	21,038	11,693	71,097
	Estimated Throughput	21			21			
10. Nonferrous Foundries	Establishments		0	none	0			
	Employment		0		0	0	0	0
	Annual Payroll		0		0	0	0	0
	Estimated Receipts		0		0	0	0	0
	Estimated Throughput	8			8			
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	6	0	none	6			
	Employment	802	0		802	715	721	2,238
	Annual Payroll	37,187	0		37,187	31,463	24,896	93,547
	Estimated Receipts	220,425	0		220,425	91,595	65,648	377,669
	Estimated Throughput	669			669			
12. Paper-Based Product Manufacturers	Establishments	3	0	none	3			
	Employment	121	0		121	85	95	301
	Annual Payroll	5,332	0		5,332	3,774	3,300	12,407
	Estimated Receipts	26,662	0		26,662	10,693	8,673	46,028
	Estimated Throughput	54			54			
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	3	(3)	rock quarries	0			
	Employment	(D)	(D)		0	0	0	0
	Annual Payroll	(D)	(D)		0	0	0	0
	Estimated Receipts	(D)	(D)		0	0	0	0
	Estimated Throughput	(D)			0			
14. Plastics Reclaimers	Establishments	0	0	none	0			
	Employment	62	0		62	40	38	140
	Annual Payroll	1,835	0		1,835	1,637	1,255	4,727
	Estimated Receipts	5,249	0		5,249	2,613	1,919	9,781
	Estimated Throughput	10			10			
15. Plastics Converters	Establishments	1	0	none	1			
	Employment	165	0		165	106	100	371
	Annual Payroll	5,073	0		5,073	4,525	3,468	13,067
	Estimated Receipts	26,316	0		26,316	13,100	9,623	49,039
	Estimated Throughput	2			2			

## FUTURE GROWTH SCENARIOS

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
16. Rubber Product Manufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
17. Steel Mills	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	501			501			
18. Iron and Steel Foundries	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	43			43			
19. Other Recycling Processors/Manufacturers	Establishments	6	0	various	6			
	Employment	184	(92)		92	42	39	173
	Annual Payroll	3,841	(1,920)		1,920	1,671	1,292	4,884
	Estimated Receipts	40,967	(20,484)		20,484	10,119	7,511	38,114
	Estimated Throughput	203			203			
Recycling Industry Subtotal	Establishments	312	(5)		307			
	Employment	17,169	(4,634)		12,534	5,834	8,159	26,527
	Annual Payroll (\$1,000)	532,658	(163,187)		369,472	176,572	197,235	743,279
	Estimated Receipts (\$1,000)	5,931,625	(792,113)		5,139,512	1,662,532	2,404,475	9,206,519

Reuse and Remanufacturing Industry Economic Activity								
20. Computer & Electronic Appliance Demanufacturers	Establishments	1	0	none	1			
	Employment	26	0		26	10	11	47
	Annual Payroll	582	0		582	428	364	1,374
	Estimated Receipts	2,530	0		2,530	1,385	1,015	4,930
	Estimated Throughput							
21. Motor Vehicle Parts (used)	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							

## SECTION 6

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
22. Retail Used Merchandise Sales	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
23. Tire Retreaders	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
24. Wood Reuse	Establishments	4	0	pallet makers	4			
	Employment	78	(78)	lumberyards	0	0	0	0
	Annual Payroll	1,787	(1,787)		0	0	0	0
	Estimated Receipts	6,514	(6,514)		0	0	0	0
	Estimated Throughput							
25. Materials Exchange Services	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
26. Other Reuse	Establishments	1	0	various	1			
	Employment	65	(65)		0	0	0	0
	Annual Payroll	1,398	(1,398)		0	0	0	0
	Estimated Receipts	7,312	(7,312)		0	0	0	0
	Estimated Throughput							
Reuse Industry Subtotals	Establishments	6	0		6			
	Employment	169	(143)		26	10	11	47
	Annual Payroll (\$1,000)	3,767	(3,185)		582	428	364	1,374
	Estimated Receipts (\$1,000)	16,357	(13,827)		2,530	1,385	1,015	4,930

GRAND TOTALS	Establishments	318	(5)		313			
Recycling and Reuse/Remanufacturing	Employment	17,338	(4,777)		12,560	5,844	8,170	26,574
	Annual Payroll (\$1,000)	536,425	(166,372)		370,054	177,000	197,598	744,652
	Estimated Receipts (\$1,000)	5,947,982	(805,940)		5,142,041	1,663,918	2,405,489	9,211,449

Because Illinois has end market demand that outstrips in-state supply for many materials (as shown in Table 6-4 and discussed previously) it was assumed that materials substitution of Illinois recovered material for imported recovered material would occur in most recycling manufacturing instances, even at a statewide 50 percent recycling rate. Therefore, most of the increases in economic activity were estimated to occur in local collection and processing. However, it was assumed that opportunities exist to expand recycling manufacturing in Illinois exist in a few areas, including:

- Expansion of secondary smelting of nonferrous metals through production increases at existing smelters and the addition of two new establishments;
- One virgin-metal nonferrous product producer converts to using recovered material;
- Six new paper/paperboard mills open in the state – two newsprint and four paperboard/linerboard mills;
- Three new other paper products manufacturers open plants in the state;
- Plastics reclaimers already in Illinois expand their production;
- One virgin plastic converter shifts production to use recycled plastics; and
- Six new establishments open to recycle a variety of other recovered materials.

It was also assumed that one new reuse establishment would open to demanufacture computers and other electronic appliances.

#### 6.4.2.3 COSTS AND BENEFITS

As was discussed under the previous scenario (achieving a 35 percent recycling rate) it was assumed for the purposes of this analysis that state government program expenditures at a level of five percent of net program costs incurred by local governments and the private sector would be sufficient to increase recycling in the state to the 50 percent level. Local government costs were directly estimated from the specific program changes local governments would make to achieve increased recycling as listed in Section 6.4.2.1 and adjusted for disposal cost savings at the statewide average tipping fee level. Cost estimates for private sector diversion programs were assumed to be \$5 for every additional ton diverted from disposal. Based on these assumptions, a comparison of the costs and benefits for achieving a 50 percent recycling rate are listed in Table 6-8.

**TABLE 6-8**  
**COST-BENEFIT COMPARISON OF ACHIEVING A 50 PERCENT RECYCLING RATE**

ALL VALUES ARE IN ARE IN \$MILLIONS

	Government		Commercial Sector	Total
	State	Local		
Costs				
Net Additional Cost to Achieve 50% <sup>1</sup>	5	44	50	99
Benefits				
Recycling and Reuse Industry Tax Payments	28	27	0	55
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	70	68	0	138

<sup>1</sup> Net of avoided disposal cost savings.

<sup>2</sup> Included taxes from indirect and induced economic activity stimulated by the recycling and reuse industry.

In reviewing the information presented in Table 6-8, it should be noted that revenues associated with increasing the state tipping fee surcharge by \$1.20 per ton are not included in the analysis because they are derived from waste disposal and are not recycling program costs or benefits. The revenues associated with the increased tipping fee surcharge are estimated to amount to \$13 million per year, and can be used to offset the additional costs to achieve a 50 percent recycling rate.

### **6.4.3 IMPLEMENTING A BAN ON THE LANDFILLING OF ELECTRONICS**

#### **6.4.3.1 GROWTH SCENARIO PROGRAM ELEMENTS AND ASSUMPTIONS**

A primary assumption for this scenario is that all electronic goods are banned from landfill disposal, and not just goods bearing heavy metals, such as cathode ray tubes (e.g., computer monitors and television screens). Specific program elements for the State to implement include:

- Ban the landfill disposal of electronic goods in Illinois; and
- Promote recycling of electronics and work for the development of markets.

Specific program elements for local governments to implement include:

- Implement collection programs for discarded electronics.

It is assumed that implementing these program elements will result in an 83 percent recovery rate for electronic goods.

#### **6.4.3.2 ECONOMIC IMPACTS**

Table 6-9 shows the estimated economic impacts of banning electronic goods from landfill disposal. The only offsets of economic activity in other sectors of the Illinois economy was assumed to occur in waste collection and landfilling.



**TABLE 6-9**  
**ECONOMIC IMPACT OF BANNING THE LANDFILLING OF ELECTRONICS**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS.

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
Recycling Industry Economic Activity								
1. Government Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	136	(39)		96	4	36	136
	Annual Payroll	4,716	(1,378)		3,338	158	1,258	4,754
	Estimated Receipts	9,606	(5,834)		3,772	242	1,850	5,865
	Estimated Throughput	96			96			
2. Private Staffed Collection	Establishments	0	0	waste collection	0			
	Employment	241	(52)		189	17	86	292
	Annual Payroll	8,384	(1,837)		6,547	578	2,564	9,689
	Estimated Receipts	16,879	(7,778)		9,101	1,201	5,446	15,747
	Estimated Throughput	129			129			
3. Compost and Miscellaneous Organics Producers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
4. Materials Recovery Facilities (MRF's)	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
5. Recyclable Material Wholesalers	Establishments	0	0	landfills	0			
	Employment	423	(20)		402	179	290	872
	Annual Payroll	13,504	(802)		12,702	4,273	6,109	23,084
	Estimated Receipts	208,025	(5,681)		202,345	62,567	99,192	364,103
	Estimated Throughput	225			225			
6. Glass Container Manufacturing Plants	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
7. Glass Product Producers (other recycled uses)	Establishments	1	0	none	1			
	Employment	130	0		130	32	45	207
	Annual Payroll	2,780	0		2,780	1,266	1,458	5,504
	Estimated Receipts	11,255	0		11,255	3,773	4,164	19,192
	Estimated Throughput	72			72			

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Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
8. Nonferrous Secondary Smelting and Refining Mills	Establishments	1	0	none	1			
	Employment	152	0		152	303	235	690
	Annual Payroll	6,158	0		6,158	12,731	7,031	25,920
	Estimated Receipts	91,809	0		91,809	38,194	19,325	149,328
	Estimated Throughput	22			22			
9. Nonferrous Product Producers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
10. Nonferrous Foundries	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
11. Paper, Paperboard, and Deinked Market Pulp Mills	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
12. Paper-Based Product Manufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
13. Pavement Mix Producers (asphalt and aggregate)	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
14. Plastics Reclaimers	Establishments	1	0	none	1			
	Employment	115	0		115	74	70	260
	Annual Payroll	3,399	0		3,399	3,032	2,324	8,754
	Estimated Receipts	9,720	0		9,720	4,838	3,554	18,113
	Estimated Throughput	18			18			
15. Plastics Converters	Establishments	4	0	none	4			
	Employment	306	0		306	197	185	688
	Annual Payroll	9,395	0		9,395	8,380	6,423	24,197
	Estimated Receipts	48,733	0		48,733	24,259	17,820	90,812
	Estimated Throughput	5			5			

## FUTURE GROWTH SCENARIOS

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
16. Rubber Product Manufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
17. Steel Mills	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	78			78			
18. Iron and Steel Foundries	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	10			10			
19. Other Recycling Processors/Manufacturers	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput	0			0			
Recycling Industry Subtotal	Establishments	7	0		7			
	Employment	1,503	(112)		1,391	806	948	3,144
	Annual Payroll (\$1,000)	48,336	(4,017)		44,319	30,417	27,168	101,903
	Estimated Receipts (\$1,000)	396,027	(19,293)		376,734	135,074	151,352	663,160

Reuse and Remanufacturing Industry Economic Activity								
20. Computer & Electronic Appliance Demanufacturers	Establishments	16	0	none	16			
	Employment	422	0		422	166	181	768
	Annual Payroll	9,534	0		9,534	7,007	5,954	22,495
	Estimated Receipts	41,426	0		41,426	22,688	16,615	80,729
	Estimated Throughput	225			225			
21. Motor Vehicle Parts (used)	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							

## SECTION 6

Business Category	Data Type	Estimated Industry Additional Economic Activity	Estimated Effect On Other Sectors		Net Direct Economic Impact	Estimated Indirect Impacts	Estimated Induced Impacts	Total Impacts
			Reduced Economic Activity	Sectors Affected				
22. Retail Used Merchandise Sales	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
23. Tire Retreaders	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
24. Wood Reuse	Establishments	0	0	none	2			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
25. Materials Exchange Services	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
26. Other Reuse	Establishments	0	0	none	0			
	Employment	0	0		0	0	0	0
	Annual Payroll	0	0		0	0	0	0
	Estimated Receipts	0	0		0	0	0	0
	Estimated Throughput							
Reuse Industry Subtotals	Establishments	16	0		16			
	Employment	422	0		422	166	181	768
	Annual Payroll (\$1,000)	9,534	0		9,534	7,007	5,954	22,495
	Estimated Receipts (\$1,000)	41,426	0		41,426	22,688	16,615	80,729

GRAND TOTALS Recycling and Reuse/Remanufacturing	Establishments	23	0		23			
	Employment	1,925	(112)		1,813	971	1,128	3,913
	Annual Payroll (\$1,000)	57,870	(4,017)		53,853	37,424	33,121	124,397
	Estimated Receipts (\$1,000)	437,453	(19,293)		418,161	157,762	167,966	743,889

The electronics recycling infrastructure is new and growing and affords opportunities for economic growth as major regional recycling facilities and smaller sorting and dismantling facilities consider where to locate. The figures in Table 6-9 assume:

- One specialized cathode ray tube recycler locates in Illinois – half the material it processes comes from Illinois and the remainder comes from neighboring states;
- Expansion of secondary smelting of nonferrous metals through production increases at existing smelters and the addition of one new establishment;
- One new plastics reclaimer that is specially equipped for sorting plastics from electronics opens a plant in the state;
- Four plastics converters shift their production to use recycled plastics; and
- Sixteen new establishments open to dismantle electronics.

#### 6.4.3.3 COSTS AND BENEFITS

As was discussed under the previous scenarios, it was assumed for the purposes of this analysis that state government program expenditures at a level of five percent of net program costs incurred by local governments and the private sector would be an appropriate level of state support. Local government costs were estimated from collection and processing program costs found from a literature review (\$280 per ton). Based on these assumptions, a comparison of the costs and benefits for banning the landfill disposal of electronics is listed in Table 6-10.

**TABLE 6-10**  
**COST-BENEFIT COMPARISON OF BANNING THE LANDFILLING OF ELECTRONICS**

ALL VALUES ARE IN ARE IN \$MILLIONS

	Government		Commercial Sector	Total
	State	Local		
Costs				
Net Additional Cost of an Electronics Landfill Ban <sup>1</sup>	2	41	0	43
Benefits				
Recycling and Reuse Industry Tax Payments	4	4	0	8
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	10	10	0	20

<sup>1</sup> Net of avoided disposal cost savings.

<sup>2</sup> Included taxes from indirect and induced economic activity stimulated by the recycling and reuse industry.

In reviewing the information presented in Table 6-10, it should be noted that there was no revenue tipping fee surcharge increase assumed by this scenario.

## 6.5 SUMMARY OF FUTURE GROWTH OPPORTUNITIES

Table 6-11 summarizes the economic impacts associated with each growth scenario. These estimated impacts are true economic growth, net of offsets in other sectors of the Illinois economy.

**TABLE 6-11**  
**ESTIMATED ECONOMIC IMPACTS OF INDUSTRY GROWTH SCENARIOS**

ANNUAL PAYROLL AND ESTIMATED RECEIPTS ARE IN \$1,000. THROUGHPUT IS IN THOUSANDS OF TONS

Data Type	Direct Impacts by Industry Sector					Total Impacts <sup>1</sup>
	Recycling Collection	Recycling Processing	Recycling Manufacturing	Reuse and Remanufacturing	Direct Industry Total	
35 Percent Recycling Rate						
Establishments	0	104	15	2	121	N/A
Employment	1,324	5,180	1,123	0	7,627	16,042
Annual Payroll	45,798	131,706	45,368	0	222,873	456,796
Estimated Receipts	46,307	2,356,388	354,614	0	2,757,308	4,931,119
Estimated Throughput	3,735	3,735	1,223	N/A	N/A	N/A
50 Percent Recycling Rate						
Establishments	0	288	19	6	313	N/A
Employment	1,740	9,156	1,638	26	12,560	26,574
Annual Payroll	60,185	241,785	67,502	582	370,054	744,652
Estimated Receipts	60,853	4,577,104	501,555	2,530	5,142,041	9,211,449
Estimated Throughput	6,861	6,861	1,635	N/A	N/A	N/A
Electronics Landfill Ban						
Establishments	0	0	7	16	23	N/A
Employment	285	402	703	422	1,813	3,913
Annual Payroll	9,885	12,702	21,732	9,534	53,853	124,397
Estimated Receipts	12,873	202,345	161,517	41,426	418,161	743,889
Estimated Throughput	225	225	205	N/A	N/A	N/A

<sup>1</sup> Includes net economic impacts in other sectors of the economy stimulated by business spending for goods and services by recycling and reuse industry, and personal spending by employees of their wages.

As Table 6-11 shows, the greatest impacts of industry growth are seen in recycling collection and processing, rather than in recycling manufacturing. This is because recycling manufacturing is undertaken not as a recycling service, but in order to produce goods for consumption by in-state purchasers or for export to other states and countries. If using recycled materials in place of alternate raw materials can make Illinois manufacturers more competitive than out-of-state manufacturers, recycling manufacturing in Illinois can grow. Otherwise, materials substitution does not result in economic growth.

Table 6-12 summarizes the costs and benefits of the three specific future growth scenarios investigated in this study.

**TABLE 6-12**  
**COST-BENEFIT COMPARISON OF FUTURE GROWTH SCENARIOS**

ALL VALUES ARE IN ARE IN \$MILLIONS

	Government		Commercial Sector	Total
	State	Local		
35 Percent Recycling Rate				
Costs				
Net Additional Cost to Achieve 35% <sup>1</sup>	2	24	18	44
Benefits				
Recycling and Reuse Industry Tax Payments	17	16	0	33
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	43	41	0	84
50 Percent Recycling Rate				
Costs				
Net Additional Cost to Achieve 50% <sup>1</sup>	5	44	50	99
Benefits				
Recycling and Reuse Industry Tax Payments	28	27	0	55
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	70	68	0	138
Electronics Landfill Ban				
Costs				
Net Additional Cost of an Electronics Landfill Ban <sup>1</sup>	2	41	0	43
Benefits				
Recycling and Reuse Industry Tax Payments	4	4	0	8
Total Taxes Attributable to the Recycling and Reuse Industry <sup>2</sup>	10	10	0	20

<sup>1</sup> Net of avoided disposal cost savings.

<sup>2</sup> Included taxes from indirect and induced economic activity stimulated by the recycling and reuse industry.

In addition to the costs and benefits listed in Table 6-12, there are other benefits to recycling that have not been quantified in this study, including:

- Disposal tip fee cost savings;
- Job creation;
- Extending landfill life;
- Energy savings;
- Greenhouse gas reduction;
- Atmospheric and waterborne emissions reductions; and
- Resource conservation.

The State of Illinois must consider the relative importance of these additional benefits, compared to those that were quantified, as it steers the course into the future of waste reduction and recycling in Illinois.

## APPENDIX A

# DESCRIPTION OF RECYCLING AND REUSE BUSINESS CATEGORIES

Table A-1 provides detailed descriptions of 30 recycling and reuse business categories, grouped into 5 industry segments. The table is intended to comprehensively include all business establishments undertaking recycling and reuse economic activities, as defined in Section 2.

Table A-1 lists *Standard Industrial Classification* (SIC) codes for each category. These codes were identified by comparing each category to the official definitions listed in the *Standard Industrial Classification Manual, 1987*, prepared by the Executive Office of the President, Office of Management and Budget. Note that in most cases, the listed SIC category also includes businesses not involved in recycling and reuse. Beginning in 1997 the SIC system will gradually be phased out and replaced by the new *North American Industry Classification System* (NAICS), which is harmonious with systems used in Mexico and Canada, in accordance with the North American Free Trade Agreement. Table A-1 also lists the NAICS codes that correspond to the traditional SIC codes. Where the NAICS categories differ significantly, the new category name is provided. Notable changes in the NAICS system include a new category for material recovery facilities, and a division of SIC 4953, Refuse Systems into separate categories for haulers and disposal facility operators handling hazardous, solid and other wastes.

**TABLE A-1**  
**DESCRIPTIONS OF INDUSTRY SEGMENTS AND BUSINESS CATEGORIES OF THE RECYCLING AND REUSE INDUSTRIES**

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
Recycling Collection	<b>1. Government Staffed Residential Curbside Collection</b> Programs staffed by municipal, state or other government agencies that provide curbside, drop-off or other recycling collection services. Does not include programs focused on education, market development or other activities not directly supporting collection programs. Does not include municipal programs staffed by private contractors.	4212 Local Trucking Without Storage	562111 Solid Waste Collection (without disposal)
	<b>2. Private Staffed Residential Curbside Collection</b> Private sector establishments that provide recycling collection services to residential waste generators, sometimes under contract to municipal or state government agencies. The primary activity of many of these establishments is waste hauling.	4212 Local Trucking Without Storage	562111 Solid Waste Collection (without disposal)
Recycling Processing	<b>3. Compost and Miscellaneous Organics Producers</b> Establishments that produce compost, mulch, bark, and other soil amendment or landscaping products from source separated yard trimmings, discarded wood and food, biosolids and other organic feedstocks. This category also includes vermiculture.	2875 Fertilizers (mixing only)	325314 Fertilizers (mixing only)



## APPENDIX A

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
<b>Recycling Processing (Continued)</b>	<b>4. Materials Recovery Facilities</b> Establishments that accept mixed and/or source separated recyclables, typically from municipal curbside and drop-off collection programs. Activities include sorting, baling, grinding, densifying and/or brokering recyclables for wholesale distribution. May also segregate recyclables from mixed solid waste. This category is intended to be defined consistently with the new NAICS category for materials recovery facilities.	4953 Refuse Systems	56292 Material Recovery Facilities
	<b>5. Recyclable Material Wholesalers</b> Establishments that process recycled materials by sorting, grading, densifying, removing contaminants and otherwise preparing the materials for shipment to manufacturing facilities for use in industrial production. Examples include paper stock dealers and scrap metal processors. These establishments may also provide recycling collection services. This category is intended to be defined consistently with the new NAICS category for recyclable material wholesalers.	5093 Scrap & Waste Material Wholesalers	42193 Recyclable Material Wholesalers
<b>Recycling Manufacturing</b>	<b>6. Glass Container Manufacturing Plants</b> Establishments that produce finished glass containers for shipment to bottlers, using recycled glass cullet as a feedstock. May also undertake beneficiation activities on site.	3221 Glass Containers	327213 Glass Containers
	<b>7. Glass Product Producers (other recycled uses)</b> Establishments that produce products other than containers, using recycled glass as a feedstock. Examples include fiberglass, decorative tiles, glassware, and construction blocks.	3229 Pressed and Blown Glass and Glassware	327212 Pressed and Blown Glass and Glassware
	<b>8. Nonferrous Secondary Smelting and Refining Mills</b> Establishments involved in the recovery and alloying of nonferrous metals. Activities include grading, sorting, detinning, refining, and other processes. Produce intermediate products such as ingot. May also include fabrication of basic products. Note that primary smelters of nonferrous metals, excluding aluminum and copper, process scrap in addition to virgin materials. Primary aluminum and copper smelters do not process scrap.	3341 Secondary smelting and refining of nonferrous metals 3339 Primary smelting and refining of nonferrous metals, except copper and aluminum	331314, 331423, 331492 Miscellaneous Secondary Nonferrous Smelting, Refining and Alloying.
	<b>9. Nonferrous Product Producers</b> Establishments that produce a wide range of intermediate products through extrusion processes, primarily from billet manufactured in smelting operations. Many of these plants may also operate in-house casting operations that process unrefined nonferrous scrap.	3351 - 3356 Miscellaneous Nonferrous Products	331421, 331315, 331315, 331316, 331319 Miscellaneous Nonferrous Products
	<b>10. Nonferrous Foundries</b> Establishments that produce castings and die-castings of various nonferrous metals and alloys. Note that many manufacturers of specific end products (e.g., automobiles) may operate foundries and purchase scrap.	3363 - 3369 Nonferrous Foundries	331521 – 331528 Nonferrous Foundries

## DESCRIPTION OF RECYCLING AND REUSE BUSINESS CATEGORIES

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
<b>Recycling Manufacturing (Continued)</b>	<b>11. Paper and Paperboard Mills/Deinked Market Pulp Producers</b> Establishments that produce first stage intermediate paper and paper board products (e.g., paper rolls) using recovered paper or deinked market pulp as a feedstock. Also includes establishments that deink recovered paper and produce market pulp for sale to paper and paperboard mills.	2621 Paper Mills 2631 Paperboard Mills	322121 Paper Mills (Except newsprint) 322122 Newsprint Mills 322123 Paperboard Mills
	<b>12. Paper-based Product Manufacturers</b> Establishments that produce paper products other than traditional paper and paperboard products, using discarded paper as a feedstock. Examples include cellulose insulation, molded fiber products, construction board, hydro-seeding mulch or animal bedding.	2679 Miscellaneous Converted Paper and Paperboard Products	322299 Other Converted Paper Product Manufacturing (egg cartons, molded pulp)
	<b>13. Pavement Mix Producers (asphalt and aggregate)</b> Establishments that produce asphalt paving mix and aggregate for use in road construction using recycled pavement, asphalt, rubber modified asphalt and/or glass, in addition to virgin materials.	2951 Asphalt paving mixtures and blocks	324121 Asphalt paving mixtures and blocks
	<b>14. Plastics Reclaimers</b> Establishments that produce plastic pellets or granulated plastic suitable for use by plastics product manufacturers. Activities include separating, washing, grinding, flaking and/or pelletizing. This category also includes establishments that manufacture intermediate products directly from unprocessed recycled plastic, such as plastic lumber products.	3087 Custom Compounding of Purchased Plastics Resins	325991 Custom Compounding of Purchased Plastics Resins
	<b>15. Plastic Converters</b> Establishments that produce intermediate plastic products (e.g., molded products and components, sheet and fiber) using recycled pellets or granulated plastic as a feedstock.	3081 – 3089 Miscellaneous Plastics Products	3261 Plastics Product Manufacturing
	<b>16. Rubber Product Manufacturers</b> Establishments that produce first-stage intermediate products or end products using crumb rubber as a feedstock.	3069 Miscellaneous fabricated rubber products 3011 Tires and inner tubes 3021 Rubber and plastics footwear 3052 Rubber & plastics hose & belting 3053 Gaskets, packing and sealing devices	3262 Rubber Product Manufacturing

## APPENDIX A

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
<b>Recycling Manufacturing (Continued)</b>	<b>17. Steel Mills</b> Basic oxygen furnaces (BOF) producing raw steel in various forms using a mix of scrap and molten iron made in blast furnaces from scrap and raw materials (iron ore, coke, limestone) and also electric arc furnaces (EAF) using scrap. Products from EAF mills are primarily slabs, billets or rebar. Products from BOF mills are primarily flat or rolled products. Activities include grading scrap, detinning, refining and product fabrication. Additional fabrication and assembly of final stage products may occur at these facilities.	3312 Steel works, Blast Furnaces and Rolling Mills	331111 Iron and Steel Mills
	<b>18. Iron and steel foundries</b> Establishments that produce a wide range of cast steel products using unrefined scrap and steel ingot produced in steel mills. Activities may include grading scrap, refining and casting.	3321 - 3325 Iron and Steel Foundries	331511 – 331513 Iron and Steel Foundries
	<b>19. Other recycling processors and manufacturers</b> Other recycling processors and manufacturers, not elsewhere classified. May include used oil refiners, household hazardous waste processors, agricultural facilities or landscapers using ash or paper mill sludge, engineering applications of tires, and other users of materials not elsewhere classified.	Varied.	Varied.
<b>Reuse and Remanufacturing</b>	<b>20. Computer and Electronic Appliance Demanufacturers</b> Establishments that sort, classify, grade and remanufacture used electronic appliances, primarily computers. Remanufacture may encompass entire appliances or components. These establishments may also recycle materials not suitable for remanufacture.	5065 Electronic Parts, NEC 7378 Computer Maint. and Repair	421690 Other Electronic Parts & Equipment Wholesale 811212 Computer & Office Machine Repair and Maintenance
	<b>21. Motor Vehicle Parts</b> Establishments that clean, sort, inspect and remanufacture used motor vehicle parts.	5015 Wholesale Used Motor Vehicle Parts	42114 Motor Vehicle Parts (Used) Wholesale
	<b>22. Retail Used Merchandise Sales</b> Establishments that operate retail sales facilities dedicated to reused products. Activities may include providing drop-off or pick-up collection services for used products; cleaning, repairing and otherwise preparing products for resale. Includes "thrift" stores, reusable product depots, reuse centers and product-specific stores such as used clothing and used sporting goods, not elsewhere classified.	5932 Used Merchandise Stores (retail)	45331 Used Merchandise Stores (excluding pawn shops)
	<b>23. Tire Retreaders</b> Establishments that sort, clean, buff and remanufacture used tires by adding new tread. These establishments produce crumb rubber as a by-product.	7534 Tire Retreading and Repair Shops	326212 Tire Retreading

## DESCRIPTION OF RECYCLING AND REUSE BUSINESS CATEGORIES

Industry Sector	Business Categories in Sector	Typical SIC Code Assignments	Typical NAICS Code Assignments
<b>Reuse and Remanufacturing (Continued)</b>	<b>24. Wood Reuse</b> Establishments that produce graded lumber and/or finished goods by cleaning, grading, and otherwise processing used wood. Includes establishments that purchase used, damaged pallets and remanufacture for reuse. Does not include establishments whose primary product is fuel.	2448 Wood Pallets and Skids 2499 Wood Products, NEC	32192 Wood Container and Pallet Manufacturing 321999 Wood Products, NEC
	<b>25. Materials Exchange Services</b> Establishments that provide listings and otherwise facilitate the reuse of products and materials, primarily by commercial and industrial establishments.	7389 Business Services NEC	54199 All Other Professional, Scientific, and Technical Services
	<b>26. Other Reuse</b> Establishments not elsewhere classified that purchase used equipment or merchandise and remanufacture, clean and otherwise prepare the used products for distribution.	5082-5084 Wholesale Machinery, Equipment, and Supplies	42181-42183 Wholesale Machinery, Equipment, and Supplies
<b>Support Businesses</b>	<b>27. Recycling and Reuse Equipment Manufacturers and Vendors</b> Establishments that produce the primary equipment used by recycling businesses. Includes all significant equipment used by collection and intermediate processing establishments, such as trucks, balers, conveyors, magnets, automated sortation devices, grinders, choppers, etc. Also includes specialized equipment used specifically to accommodate recycled materials in manufacturing processes, or to process or remanufacture used products. Examples include plastic bottle washing, sorting and pelletizing systems, paper deinking systems, tire processing equipment, glass bottle washing systems, etc. This category does not include standard processing and manufacturing equipment not specifically designed for recycling or reuse.	3511 - 3599 Industrial Machinery and Equipment	333 Machinery Manufacturing
	<b>28. Consulting and Engineering Services</b> Establishments that provide technical research and development services and engineering services to recycling collectors and intermediate processors, and reuse establishments, and that provide specialized services essential to the recycling or reuse process in manufacturing facilities. Examples include engineering services to develop deinking plants, composting facilities and plastics processing facilities. Broad consulting services to government or non-profits that does not directly support establishments listed above are not included.	8733 Noncommercial Research Organizations 8711 Engineering services 8742 Management consulting services	54133 Engineering Services 541611- 541614 Management Consulting Services
	<b>29. Brokers</b> Establishments that purchase recycled materials or reusable products for purposes of resale without processing or otherwise adding value. Includes export brokerage services.	5093 Scrap and Waste Material Wholesalers 4731 Arrangement of Transportation of Freight and Cargo	42193 Recyclable Material Wholesalers 48851 Freight Transportation Arrangement
	<b>30. Transporters</b> Establishments that transport recovered materials or reusable products to intermediate processing facilities and/or processing and end-use facilities by air, truck, sea or rail.	4011 – 4499 Freight Services	481 – 484 Air, Rail, Water, and Truck Transportation

**APPENDIX A**

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## APPENDIX B DATA SOURCES

Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
1	<i>Paper Matcher</i>	American Forest & Paper Association	Paper and paperboard mills, paper dealers, recycling centers		✓	Used to estimate percentage of mills consuming recovered paper for existing data adjustments.
2	<i>Wood Recycling Directory - 1996</i>	American Forest & Paper Association	C&D processors, miscellaneous organic products, compost producers	✓		Used for building survey contact list.
3	<i>Handler/Reclaimer Database</i>	American Plastics Council	Plastics handlers, reclaimers		✓	Used to estimate employment and establishments for plastics reclaimers.
4	<i>ARM Directory and Buyers Guide</i>	American Recycling Markets	Collectors, intermediate processors, processors, manufacturers, brokers and equipment dealers	✓		Used for building survey contact list.
5	<i>1998-1999 Directory</i>	Asphalt Recycling and Reclaiming Association	Aggregate producers and pavement mix, specialized reuse and recycling equipment manufacturers, consulting and engineering services	✓		Used for building survey contact list of aggregate and pavement mix producers.
6	<i>Recycling Product News</i>	Baum Publications	Recycling equipment manufacturers	✓		Used for building survey contact list of equipment manufacturers.
7	<i>Manufacturer Database (Access)</i>	Cellulose Insulation Manufacturers Association	Cellulose insulation manufacturers	✓		Used for building survey contact list for paper-based product manufacturers
8	<i>Reuse/Recycling of Glass Cullet for Non-Container Uses</i>	Dane County DPW	Manufacturers of recycled glass products other than containers	✓		Used for building survey contact list for glass product producers (other recycling uses).
9	<i>Product and Equipment Specifications Reports</i>	Downing & Associates	Compost and wood waste, recycling and solid waste equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
10	<i>Organics Mailing List</i>	Downing & Associates	Compost and wood waste, recycling and solid waste	✓		3,800 listings, comprehensive source.
11	<i>Markets List</i>	Glass Packaging Institute	Glass beneficiation facilities/Glass container plants; Glass container manufacturing plants	✓		Used for building survey contact list for glass container manufacturing plants.

## APPENDIX B

Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
12	<i>MRF Yearbook</i>	Governmental Advisory Associates	MRFs and mixed waste processing facilities in US	✓		Used for building survey contact list for MRFs.
13	<i>Harris Directory</i>	The Harris Reports	Miscellaneous processing and manufacture, remanufacturing and wholesale sales, materials exchange services (focused on building, interior, garden products). Contains 1,000 records.	✓		Used for building survey contact list for reuse.
14	<i>Lockwood Post Directory of the Pulp Paper and Allied Trades</i>	Miller Freeman Publishing, Inc.	Pulp & paper mills, converting plants, paper merchants/distributors, wastepaper stock suppliers		✓	Used to estimate percentage of mills consuming recovered paper for existing data adjustments.
15	<i>Molded Pulp Product Manufacturers</i>	Molded Pulp Environmental Association	Molded pulp producers	✓		Used for building survey contact list for paper-based product manufacturers.
16	<i>Nebraska Recycling Resource Directory</i>	Nebraska Department of Environmental Quality	Recycled product manufacturers	✓		Used for building survey contact list for multiple categories.
17	<i>Member List</i>	North American Insulation Manufacturing Association	Fiberglass insulation producers	✓		Used for building survey contact list for glass product producers (other recycling uses).
18	<i>Scrap Tire and Rubber Users Directory</i>	Recycling Research Institute	Tire and rubber recyclers, equipment providers, general info	✓		Used for building survey contact list for rubber product manufacturers.
19	<i>Buyers Guide 1998</i>	Recycling Today Magazine	Equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
20	<i>Mailing List</i>	Resource Recycling, Inc	Over 41,000 records in numerous categories	✓		Used for building survey contact list.
21	<i>1996 Directory of U.S. and Canadian Scrap Plastics Processors and Buyers</i>	Resource Recycling, Inc	Commercial recycling collectors and intermediate processors, Plastics processing and manufacture, Specialized reuse and recycling equipment manufacturers, Brokers	✓		Used for building survey contact list.
22	<i>1997-98 Equipment Directory</i>	Resource Recycling, Inc	Recycling collection and intermediate processing equipment manufacturers, specialized reuse and recycling equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
23	<i>1998 SMA Membership Directory</i>	Steel Manufacturers Association	Steel mills, Iron and steel foundries, Specialized reuse and recycling equipment manufacturers		✓	Contact and facility information for SMA members; good information on electric arc furnaces.
24	<i>Member List</i>	Used Oil Management Association	Used oil processors	✓		Only five members; National Oil Recyclers Assoc. is a better resource.

## DATA SOURCES

Resource Number	Resource/Directory	Source Organization	Types of Data/Businesses Included	Resource Use		How Used
				Survey	Existing Data	
25	<i>Regional Accounts Data, Regional Economic Profiles</i>	US Bureau of Economic Analysis	State and national average wage and total jobs data		✓	Used for statewide data to place recycling and reuse data into perspective.
26	<i>Gross State Product in Current Dollars, 1992-1998</i>	US Bureau of Economic Analysis	Gross state and national product data		✓	Used for statewide data to place recycling and reuse data into perspective.
27	<i>Standard Statistical Establishments List (SSEL)</i>	US Census Bureau	Covers all businesses		✓	Good resource for categories with corresponding SIC/NAICS codes.
28	<i>Census of Manufactures</i>	US Census Bureau	Various manufacturing industries		✓	Contains more detail than SSEL on production workers and value added by manufacture for selected industries. Useful for estimates.
29	<i>Current Industrial Reports – Manufacturing Profiles</i>	US Census Bureau	Various manufacturing industries		✓	Contains some data on material throughput. Useful for estimates.
30	<i>1997 Economic Census</i>	US Census Bureau	Covers all businesses		✓	Good resource for categories with corresponding SIC/NAICS codes and national total/average throughput figures.
31	<i>Electronics Reuse and Recycling Directory</i>	US EPA	Electronic appliance demanufacturers. Includes donation, reuse, remanufacture, recycling of computers.	✓		Used for building survey contact list for computer and electronic equipment demanufacturers.
32	<i>Mineral Commodity Reports</i>	US Geological Survey	Ferrous and non-ferrous metals recycling statistics		✓	Used for scrap consumption (throughput) data.
33	<i>1997 WASTEC Products and Services Directory</i>	Waste Equipment Technology Association	Recycling collection and intermediate equipment processing manufacturers, specialized reuse and recycling equipment manufacturers, Consulting and engineering services	✓		Used for building survey contact list for equipment manufacturers.
34	<i>Resource 1998</i>	Waste News	Equipment guide, waste focus	✓		Used for building survey contact list for equipment manufacturers.
35	<i>1997 World Wastes Buyers' Guide Edition</i>	World Wastes	Collectors and intermediate processors, Recycling collection and intermediate processing equipment manufacturers, Specialized reuse and recycling equipment manufacturers	✓		Used for building survey contact list for equipment manufacturers.
36	<i>Recycling Directory</i>	Yellow Page Publishers Association (YPPA)	Commercial recycling centers and intermediate processors, Paper processing and manufacture, Brokers which deal with old directories	✓		Used for building survey contact list for paper-based product manufacturers.



# Illinois

# 1997

Issued May 2000

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## 1997 Economic Census

*Manufacturing*

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**Table 1. Industry Statistics for the State: 1997—Con.**

[Includes data for industry groups and industries with 100 employees or more. For information on geographic areas followed by \* and explanation of terms, see appendixes. For meaning of abbreviations and symbols, see introductory text]

NAICS code	Geographic area and industry	E <sup>1</sup>	All establishments		All employees		Production workers			Value added by manufacture (\$1,000)	Cost of materials (\$1,000)	Value of shipments (\$1,000)	Total capital expenditures (\$1,000)
			Total	With 20 employees or more	Number <sup>2</sup>	Payroll (\$1,000)	Number	Hours (1,000)	Wages (\$1,000)				
<b>31-33</b>	<b>ILLINOIS—Con.</b>												
	<b>Manufacturing—Con.</b>												
321	Wood product mfg . . . . .	2	460	124	9 614	232 290	7 507	14 159	158 670	494 510	641 634	1 138 406	29 517
3211	Sawmills & wood preservation . . . . .	1	66	9	617	14 581	527	943	11 200	36 642	68 772	102 625	2 314
32111	Sawmills & wood preservation . . . . .	1	66	9	617	14 581	527	943	11 200	36 642	68 772	102 625	2 314
321113	Sawmills . . . . .	3	57	4	415	8 870	362	591	6 873	17 307	23 217	40 528	1 601
321114	Wood preservation . . . . .	—	9	5	202	5 711	165	352	4 327	19 335	45 555	62 097	713
3212	Veneer, plywood, & engineered wood product mfg . . . . .	1	39	23	2 105	55 524	1 679	3 229	37 071	124 215	157 952	282 394	9 322
32121	Veneer, plywood, & engineered wood product mfg . . . . .	1	39	23	2 105	55 524	1 679	3 229	37 071	124 215	157 952	282 394	9 322
321211	Hardwood veneer & plywood mfg . . . . .	—	4	1	175	3 714	154	321	2 705	8 670	6 978	16 109	D
321214	Truss mfg . . . . .	2	22	15	1 148	31 928	892	1 680	20 884	65 591	78 608	144 037	D
321219	Reconstituted wood product mfg . . . . .	—	13	7	782	19 882	633	1 228	13 482	49 954	72 366	122 248	5 129
3219	Other wood product mfg . . . . .	2	355	92	6 892	162 185	5 301	9 987	110 399	333 653	414 910	753 387	17 881
32191	Millwork . . . . .	2	120	27	3 093	81 793	2 295	4 406	56 583	152 578	203 183	361 368	6 149
321911	Wood window & door mfg . . . . .	2	55	15	2 200	56 044	1 570	2 976	38 226	111 418	149 481	266 804	4 340
321912	Cut stock, resawing lumber, & planing . . . . .	6	17	2	203	3 972	172	308	3 159	7 172	8 981	16 241	547
321918	Other millwork (including flooring) . . . . .	2	48	10	690	21 777	553	1 122	15 198	33 988	44 721	78 323	1 262
32192	Wood container & pallet mfg . . . . .	2	115	34	1 776	34 759	1 489	2 704	24 336	73 617	96 357	169 619	5 829
321920	Wood container & pallet mfg . . . . .	2	115	34	1 776	34 759	1 489	2 704	24 336	73 617	96 357	169 619	5 829
32199	All other wood product mfg . . . . .	1	120	31	2 023	45 633	1 517	2 877	29 480	107 458	115 370	222 400	5 903
321992	Pretabricated wood building mfg . . . . .	—	24	11	641	15 977	403	846	9 177	51 879	66 062	117 265	3 095
321999	All other miscellaneous wood product mfg . . . . .	2	93	19	g	D	D	D	D	D	D	D	D
322	Paper mfg . . . . .	—	372	263	28 968	1 015 158	21 417	46 143	647 550	2 828 666	3 054 927	5 872 807	172 283
3221	Pulp, paper, & paperboard mills . . . . .	—	10	9	1 059	49 110	823	1 829	35 521	121 693	169 405	291 096	15 032
32212	Paper mills . . . . .	—	4	3	322	18 427	240	598	13 330	47 957	57 652	106 718	D
322121	Paper (except newsprint) mills . . . . .	—	3	2	c	D	D	D	D	D	D	D	D
322122	Newsprint mills . . . . .	—	1	1	c	D	D	D	D	D	D	D	D
32213	Paperboard mills . . . . .	—	6	6	737	30 683	583	1 231	22 191	73 736	111 753	184 378	D
322130	Paperboard mills . . . . .	—	6	6	737	30 683	583	1 231	22 191	73 736	111 753	184 378	D
3222	Converted paper product mfg . . . . .	—	362	254	27 909	966 048	20 594	44 314	612 029	2 706 973	2 885 522	5 581 711	157 251
32221	Paperboard container mfg . . . . .	—	197	154	16 601	598 351	12 675	27 804	387 401	1 490 948	1 892 165	3 384 158	88 041
322211	Corrugated & solid fiber box mfg . . . . .	—	115	94	9 176	333 185	6 625	14 546	196 555	854 675	1 196 396	2 046 345	58 006
322212	Folding paperboard box mfg . . . . .	—	53	39	4 916	196 749	3 924	8 858	137 318	449 489	498 615	955 906	21 638
322213	Setup paperboard box mfg . . . . .	—	9	5	315	7 718	202	406	4 205	13 263	7 386	20 693	486
322214	Fiber can, tube, drum, & similar products mfg . . . . .	1	16	12	681	19 613	539	1 178	13 983	45 857	68 817	115 075	3 239
322215	Nonfolding sanitary food container mfg . . . . .	—	4	4	1 513	41 086	1 385	2 816	35 340	127 664	120 951	246 139	4 672
32222	Paper bag & coated & treated paper mfg . . . . .	—	75	52	5 686	203 716	3 702	7 967	113 647	758 178	611 209	1 373 457	36 397
322221	Coated & laminated packaging paper & plastics film mfg . . . . .	—	5	4	e	D	D	D	D	D	D	D	2 515
322222	Coated & laminated paper mfg . . . . .	1	43	28	3 173	115 573	1 855	3 818	61 347	478 407	360 875	843 985	25 480
322223	Plastics, foil, & coated paper bag mfg . . . . .	—	4	2	f	D	D	D	D	D	D	D	D
322224	Uncoated paper & multiwall bag mfg . . . . .	—	11	9	872	25 365	724	1 695	20 282	82 030	86 804	168 883	2 032
322225	Laminated aluminum foil mfg for flexible packaging uses . . . . .	—	7	6	276	10 530	211	445	6 278	30 188	38 260	68 099	1 999
322226	Surface-coated paperboard mfg . . . . .	—	5	3	416	21 871	252	676	8 222	105 168	58 670	164 097	D
32223	Stationery product mfg . . . . .	1	50	25	3 496	98 463	2 558	5 317	67 325	312 312	248 361	545 209	15 117
322231	Die-cut paper & paperboard office supplies mfg . . . . .	2	20	7	f	D	D	D	D	D	D	D	D
322232	Envelope mfg . . . . .	1	25	17	2 263	65 688	1 599	3 345	46 013	141 888	152 020	293 906	10 602
322233	Stationery, tablet, & related product mfg . . . . .	—	5	1	e	D	D	D	D	D	D	D	D





**Illinois Department of Commerce  
and Community Affairs**



George H. Ryan  
Governor

Pam McDonough  
Director

April 25, 2000

Joseph Groskind  
New Earth Compost Facility  
11189 Samuel Rd.  
Carterville, IL 62918-9803

**Subject: U.S. Recycling Economic Information Study**

Dear Colleague:

We are writing to ask your assistance in responding to the enclosed, brief survey. This important survey is designed to gather key economic statistics on the nation's recycling and reuse industries.

The survey requests information about your firm's activities involving the processing of recyclable and reusable materials/products, manufacturing of new products from recycled materials, or manufacturing equipment used in the recycling and reuse industries. Additional survey forms have been enclosed if you have more than one facility. (Please use a separate form for each facility.) We want to emphasize that **the information you provide will be held strictly confidential – under no circumstances will company-specific data be released.** Your responses will be aggregated with data provided by other businesses, and only released as aggregated, statewide or industry-wide totals.

Our organizations, the Illinois Department of Commerce and Community Affairs (DCCA) and the National Recycling Coalition (NRC), have retained R. W. Beck, Inc., a nationally recognized management consulting firm, to conduct the first ever U.S. Recycling Economic Information Study. As part of the study, R. W. Beck is surveying businesses like yours from throughout the nation.

Once the study is complete, we will forward a summary copy of the results to you if you participate in the study, so you can compare your company's statistics to state and national totals for businesses similar to your own. DCCA and NRC will also publish the study results and use them to promote the growth of the recycling and reuse industries. By sharing aggregate statistics with the financial community, the information will be used to help leverage the availability of capital to assist recycling entrepreneurs grow their businesses. By targeting state and federal officials, the information will help secure government action (or inaction) favorable to recycling and reuse businesses. The information will also be useful in educating the general public about the benefits your industry provides to our economy and environment.

If you have any questions regarding the enclosed survey form, please contact Tim Buwalda of R. W. Beck at (800) 873-  
fax your completed survey to R. W. Beck at (618) 230-1118. Thank you for your assistance.

Sincerely,

Internet Address <http://www.commerce.state.il.us>

620 East Adams Street  
Springfield, Illinois 62701

James R. Thompson Center  
100 West Randolph Street, Suite 3-400  
Chicago, Illinois 60601

325 West Adams Street, 3rd Floor  
Springfield, Illinois 62704-1892

2309 West Main, Suite 118  
Marion, Illinois 62959

217/782-7500  
Fax: 217/785-6454 ■ TDD: 800/785-6055

312/814-7179  
Fax: 312/814-6732 ■ TDD: 800/419-0667

217/785-2800  
Fax: 217/785-2618 ■ TDD: 217/785-0211

618/997-4394  
Fax: 618/997-1825 ■ TDD Relay: 800/526-0844

Pam McDonough  
Director,  
Illinois Department of Commerce and Community Affairs

Will Ferretti  
Executive Director,  
National Recycling Coalition

Internet Address <http://www.commerce.state.il.us>

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# U. S. Recycling Economic Information Study

<i>Company</i>  <i>Subsidiary of</i>  <i>Mailing Address</i> <small>(location where contact can be reached)</small>	New Earth Compost Facility  11189 Samuel Rd.  Carterville, IL 62918-9803	
<i>Physical Address</i> <small>(establishment location)</small>  <i>Establishment Telephone Number</i>	11189 Samuel Rd.  Carterville, IL 62918  <div style="display: flex; justify-content: space-between;"> <div>           _____ <i>Ext</i> _____  <small>Please provide at least an area code that corresponds to the PHYSICAL ADDRESS.</small> </div> <div> <small>Be sure that the ZIP CODE for the physical address is NOT for a Post Office Box.</small> </div> </div>	
<i>Contact Name</i>  <i>Title</i>  <i>Contact Telephone Number</i>  <i>Fax Number</i>  <i>E-mail Address</i>	Joseph Groskind  _____  (618) 985-5007 <i>Ext</i> _____  _____  _____	If you have any questions about this form or the U. S. Recycling Economic Information Study, please call Tim Buwalda of R. W. Beck at (800) 873-6532.

- ♦ Please make any necessary changes and spelling corrections to the information above.
- ♦ Our records show that you do not have any additional facilities.
- ♦ If we are missing one or more of your facilities, please list them below.

A. Name \_\_\_\_\_ B. Name \_\_\_\_\_ C. Name \_\_\_\_\_  
 City/State \_\_\_\_\_ City/State \_\_\_\_\_ City/State \_\_\_\_\_

# U. S. Recycling Economic Information Study

**CONFIDENTIAL SURVEY — no establishment-specific data will be released.**



National  
Recycling  
Coalition  
Inc.

- Please identify the categories that best match your establishment (check all that apply). Please complete a separate form for each location you have (make extra copies if needed).

## ESTABLISHMENT CATEGORIES

Recycling Collection		Code	Reuse and Remanufacturing		Code
<input type="checkbox"/>	Government-staffed collection	18	<input type="checkbox"/>	Computer/electronic appliance demanufacturer	12
<input type="checkbox"/>	Private-staffed collection	19	<input type="checkbox"/>	Equipment or toner cartridge remanufacturer	28
Recycling Processing and Manufacturing			<input type="checkbox"/>	Motor vehicle parts remanufacturer	29
<input type="checkbox"/>	Compost/organics processor	1	<input type="checkbox"/>	Repair shop	30
<input type="checkbox"/>	Fiberglass insulation producer	2	<input type="checkbox"/>	Retail used merchandise sales	31
<input type="checkbox"/>	Glass container manufacturing plant	3	<input type="checkbox"/>	Tire retreader	32
<input type="checkbox"/>	Glass product producer (other recycled uses)	4	<input type="checkbox"/>	Wood reuse or pallet rebuilder	13
<input type="checkbox"/>	Household hazardous waste processor	5	Support Businesses		
<input type="checkbox"/>	Materials recovery facility (commingled matls.)	6	<input type="checkbox"/>	Broker	33
<input type="checkbox"/>	Nonferrous product producer	20	<input type="checkbox"/>	Consulting/engineering company	34
<input type="checkbox"/>	Nonferrous foundry	21	<input type="checkbox"/>	Materials exchange services	14
<input type="checkbox"/>	Nonferrous smelting or refining mill	22	<input type="checkbox"/>	Recycling and reuse equipment manufacturer	15
<input type="checkbox"/>	Oil processor	7	<input type="checkbox"/>	Transporter	35
<input type="checkbox"/>	Paper, paperboard, or market pulp mill	23	Other (describe below)		
<input type="checkbox"/>	Paper-based product mfg. (e.g. insulation, bedding)	8	<input type="checkbox"/>	Other recycling processor/manufacturer	16
<input type="checkbox"/>	Pavement mix producer (asphalt or aggregate)	9	<input type="checkbox"/>	Other reuse/remanufacturer	17
<input type="checkbox"/>	Plastics converter	24	<input type="checkbox"/>	Other (none of the above)	36
<input type="checkbox"/>	Plastics reclaimer	10	Describe your establishment here:		
<input type="checkbox"/>	Recyclable materials processors (e.g. paper, metal)	25			
<input type="checkbox"/>	Rubber product manufacturer	11			
<input type="checkbox"/>	Steel or Iron foundry	26			
<input type="checkbox"/>	Steel mill	27			

## 2. If you placed a check mark by a category numbered from:

- **1-17**, please continue and complete the remaining three questions on the next page as they apply to your establishment as a recycling, manufacturing (using recycled materials), reuse, or recycling equipment manufacturer. Those questions are not intended to quantify in-house programs that reuse products or recover self-generated scrap materials.

If you checked two or more categories, please select a single category number from 1-17 that best represents the primary recycling, manufacturing (using recycled materials), reuse, or recycling equipment manufacturing activities conducted by your establishment.

**Please write the establishment category code (1-17) this form is being completed for here: \_\_\_\_**

- **18-36** you may stop and return this survey in the postage-paid envelope. Thank you!

# U. S. Recycling Economic Information Study

**CONFIDENTIAL SURVEY — no establishment-specific data will be released.**



National  
Recycling  
Coalition  
Inc.

## 3. Establishment Size Information (total this location):

<b>Total Number of Employees:</b>	<b>Most Recent Total Annual Payroll: <sup>[1]</sup></b>	<b>Most Recent Total Annual Receipts: <sup>[2]</sup></b>
<input type="checkbox"/> 0 – 9	<input type="checkbox"/> \$0 - \$49,999	<input type="checkbox"/> \$0 - \$99,999
<input type="checkbox"/> 10 – 24	<input type="checkbox"/> \$50,000 - \$99,999	<input type="checkbox"/> \$100,000 - \$249,999
<input type="checkbox"/> 25 – 49	<input type="checkbox"/> \$100,000 - \$149,999	<input type="checkbox"/> \$250,000 - \$499,999
<input type="checkbox"/> 50 – 99	<input type="checkbox"/> \$150,000 - \$499,999	<input type="checkbox"/> \$500,000 - \$999,999
<input type="checkbox"/> 100 – 199	<input type="checkbox"/> \$500,000 - \$999,999	<input type="checkbox"/> \$1,000,000 - \$2,499,999
<input type="checkbox"/> 200 – 299	<input type="checkbox"/> \$1,000,000 - \$2,499,999	<input type="checkbox"/> \$2,500,000 - \$4,999,999
<input type="checkbox"/> 300 – 399	<input type="checkbox"/> \$2,500,000 - \$4,999,999	<input type="checkbox"/> \$5,000,000 - \$7,499,999
<input type="checkbox"/> 400 – 499	<input type="checkbox"/> \$5,000,000 - \$9,999,999	<input type="checkbox"/> \$7,500,000 - \$9,999,999
<input type="checkbox"/> 500 – 1,000	<input type="checkbox"/> \$10,000,000 - \$19,999,999	<input type="checkbox"/> \$10,000,000 - \$19,999,999
_____ Please fill in	<input type="checkbox"/> \$20,000,000 - \$30,000,000	<input type="checkbox"/> \$20,000,000 - \$49,999,999
value if greater than 1,000	\$_____ Please fill	<input type="checkbox"/> \$50,000,000 - \$74,999,999
	in value if greater than \$30,000,000	<input type="checkbox"/> \$75,000,000 - \$100,000,000
		\$_____ Please fill
		in value if greater than \$100,000,000

[1] Payroll includes total salary, hourly pay, bonuses, commissions, sick-leave pay, free meals, and benefits received by employees.

[2] Receipts include revenue of all forms (sales, fees, rents, commissions, interest, dividends) minus all local, state, and federal tax revenue collected.

## 4. Covered Activities Information (this location):

<p>"Covered activities" are all activities that support:</p> <ul style="list-style-type: none"> <li>Transforming scrap materials or products into a recycled raw material</li> <li>Transforming recycled raw materials into a first intermediate product (e.g. sheet, fiber, roll)</li> <li>Transforming recycled raw materials directly into a finished product</li> <li>Preparing used products for reuse</li> <li>Manufacturing equipment for the recycling or reuse industries</li> </ul> <p>Covered activities <u>do not</u> include converting a first intermediate product to finished products or preparing materials for fuel use.</p>	<p><b>Percent of Total Production Labor Time Spent on Covered Activities:</b></p> <p><input type="checkbox"/> 0 - 9%</p> <p><input type="checkbox"/> 10 - 19%</p> <p><input type="checkbox"/> 20 - 29%</p> <p><input type="checkbox"/> 30 - 39%</p> <p><input type="checkbox"/> 40 - 49%</p> <p><input type="checkbox"/> 50 - 59%</p> <p><input type="checkbox"/> 60 - 69%</p> <p><input type="checkbox"/> 70 - 79%</p> <p><input type="checkbox"/> 80 - 89%</p> <p><input type="checkbox"/> 90 - 100%</p>	<p><b>Percent of Total Receipts from Products of Covered Activities:</b></p> <p><input type="checkbox"/> 0 - 9%</p> <p><input type="checkbox"/> 10 - 19%</p> <p><input type="checkbox"/> 20 - 29%</p> <p><input type="checkbox"/> 30 - 39%</p> <p><input type="checkbox"/> 40 - 49%</p> <p><input type="checkbox"/> 50 - 59%</p> <p><input type="checkbox"/> 60 - 69%</p> <p><input type="checkbox"/> 70 - 79%</p> <p><input type="checkbox"/> 80 - 89%</p> <p><input type="checkbox"/> 90 - 100%</p>
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If your establishment code is 1-11, please complete the following table (Question 5).

## 5. Recycling or Recycled Product Manufacturing Annual Processing Information (this location):

Input Materials	Unit of Measure	Input Quantity	Process Outputs		
			Residue Disposed	Prepared or used for fuel	Recycled product or material
Example — oil	gallons	1,000,000	5%	75%	20%
Paper					
Plastics					
Glass					
Metals					
Tires or rubber					
Construction & demolition debris <sup>[1]</sup>					
Organics <sup>[2]</sup>					
Oil or household hazardous waste					
Other					

[1] Includes concrete, asphalt, non-yard wood waste, etc. from construction, demolition, and remodeling of roads and structures.

[2] Includes yard waste, food waste, sludge, land-clearing debris and wood waste including pallets, brush, stumps/tree trunks, sawdust, and mill scrap.

Thank you for completing this survey! Please return it to R. W. Beck in the postage-paid envelope.

## Appendix E

### Analysis of Survey Results

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The statistical analysis of the survey data provided by establishments that completed surveys identified the recycling characteristics of the average establishment in each of the twelve survey business categories. These averages were then applied to all recycling and reuse establishments in each survey category to estimate the total number of employees<sup>36</sup> and dollar value of payroll and receipts.

Survey information was solicited from 543 establishments that were listed in the study database as potentially being in one of the twelve survey categories. Data obtained from 138 establishments formed the basis of the statistical analysis. Because many of the establishments initially included in the database were found to have been misclassified or gone out of business, it was necessary to re-estimate the number of establishments in each survey category before extrapolating average statistical data. In Illinois, 254 establishments are believed to be involved in recycling activities in the twelve survey categories.

The procedure for estimating the total number of establishments in each category consisted of several steps. First, businesses in the database were sent a survey in the mail, followed-up with several telephone calls if they failed to respond to the mailing. Those that were unrelated, unreachable, duplicate, or out of business were eliminated. The businesses that were either completely or partially responsive to the survey, as well as those that declined to participate or were uncooperative were counted. Further adjustments were made for businesses that changed from one category to another.

The following example will illustrate the procedure used to develop the final estimate of 59 establishments in category 3, compost and organics processors:

- From the initial list of 147 establishments that were classified as potentially being compost and organics processors, 137 were contacted (the other 10 had incomplete mail and telephone information);
- Of these 137, 2 establishments moved out of this recycling category into other categories and 81 were eliminated (unrelated, unreachable, duplicate entries, or out of business) – furthermore, 1 moved into the category (from other categories) – resulting in 55 establishments in this category.
- To these 55, we added 4 additional establishments, based on the observed “success” rate of the attempted sample and the relative amount of establishments that moved into the category, for a total of 59 establishments.<sup>37</sup>

For each variable (employment, payroll, and receipts), the sample mean, standard deviation, and other related statistics were calculated. Based on the sample size and estimate of the total number of establishments engaged in recycling in this business category, ranges were constructed that should contain the true average value for the typical recycling business in the category.<sup>38</sup> Finally, by multiplying this range by the estimate of the total number of recycling businesses in the category, we obtain a range for the total values for each variable.

Continuing with the previous example, the analysis was as follows:

---

<sup>36</sup> Employee responses were adjusted to a full-time equivalent basis. Thus, two employees each working 50% on recycling activities would be counted as one employee.

<sup>37</sup> Of the 137 establishments we attempted to contact in this category, only 55 correctly belonged in the category. We applied this 40% “success” ratio to the 10 establishments not contacted of the originally estimated 147 establishments, adding 4 establishments.

<sup>38</sup> Technically speaking, these ranges can be described as 95% confidence intervals.



- 26 responses were usable (i.e., provided data) of the 33 establishments that confirmed they belonged in the category;
- Average number of employees, payroll, and receipts for these 26 responses were calculated;
- Standard deviations and other related statistics necessary to determine a 95 percent confidence interval for the average of all establishments in this business category were calculated; and
- The low, average, and high values for the confidence interval were then multiplied by the estimated total establishments in this category (59) to yield the estimated range of the total number of employees, payroll, and receipts.

To finish this particular example, the sample of 26 establishments employed (on average) 5.5 persons per establishment in recycling activities on a full-time equivalent basis. However, given the sample size and the estimate of the total number of establishments in this business category, the actual average number of employees per establishment might range from a low of 4.3 to a high of 6.7. Thus, while 325 employees are expected to be involved in recycling activities for the entire set of 59 establishments in this business category, there may be as few as 255 or as many as 395.

Another point should also be made regarding small population sampling as it applies to certain categories. Given the small number of total establishments engaged in certain business categories, the low end of the estimates is often constrained by the fact that it cannot be less than the value already observed in the sample itself. Although this was not the case for compost and organics processors, it was the case for others where the calculated low statistic was less than the total actually reported surveyed establishments that provided statistics. In those cases, the actual reported total was used. As this issue affects the results, it serves to make certain estimates more accurate than would otherwise be possible.

## Appendix F

### Glossary of Terms

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**AF&PA** – American Forest & Paper Association.

**All Other Employees** – Non-production employees including those engaged in factory supervision above the line-supervisor level. It includes sales (including driver-salespersons), sales delivery (highway truck drivers and their helpers), advertising, credit, collection, installation and servicing of own products, clerical and routine office functions, executive, purchasing, financing, legal, personnel (including cafeteria, medical, etc.), professional, and technical employees.

**Annual Payroll** – Total annual payroll includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in kind (e.g., free meals and lodgings) paid during the year to all employees.

**APC** – American Plastics Council.

**Covered Activities** – Defined as all activities that support:

- Transforming pre-consumer scrap materials or post-consumer products into a recycled material;
- Transforming recycled materials into a first intermediate product (e.g., sheet, fiber, roll);
- Transforming recycled materials directly into a finished product;
- Preparing used products for reuse; and
- Manufacturing equipment for the recycling or reuse industries.

Covered activities *do not* include converting a first intermediate product to finished or semi-finished products or preparing materials for fuel use.

**Direct Effects** – Refers to the operational characteristics of the firms or institutions that are studied. This study measured the apparent value of twenty-six categories of recycling and reuse establishments. The direct output of these entities is, therefore, their reported gross sales. The direct jobs are the jobs that the firms that were surveyed in the states listed. The direct personal income contains their reported payments to all employees, plus an additional estimate of benefit values and of returns to sole proprietors. The estimate of benefit values and returns to sole proprietors were based on industrial averages in industries that are similar to the recycling and reuse industries included in this study.

**Employment** – Employment consists of paid full and part-time employees (counted at equal weight), including salaried officers and executives of corporations. Included are employees on sick leave, holidays, and vacations; not included are volunteers, proprietors and partners of unincorporated businesses.

**Establishment** – A single physical location where business is conducted or where services or industrial operations are performed. Establishments may government operated as well as privately operated.

**GPI** – Glass Packaging Institute.

**I-O** – Input-Output, in relation to economic modeling, refers to econometric models that are based on inter-industrial accounts data that identify the products made within a region and the products consumed by industries and households in that same region. Any industry's or institution's output (usually its gross sales) requires inputs in the form of employees, materials, utilities, capital investments, financing, maintenance, equipment, and services. The probability that a firm purchases its inputs locally is estimated in the I-O model.

**Indirect Effects** – A measurement of the value of additional economic demands that direct firms or institutions place on supplying industries in a region under study. When firms produce goods or conduct business or when public entities provide public goods or services, they must make many purchases. Some of these are from suppliers in the area. Some are not. Public utilities, communications systems, fuel, wholesale goods and services, manufactured goods, financial and legal services, raw and processed commodities, and a variety of professional services are necessary to produce the output of direct establishments.

**IMPLAN** – A basic input-output economic modeling program used in this study that is published by the Minnesota IMPLAN Group, Inc.

**Induced Effects** – These effects accrue when workers in direct and indirect industries spend their earnings on goods and services in the region. Induced effects can also be called household effects, and the terms are often used interchangeably. When workers in direct and indirect industries purchase goods and services for household consumption, they, in turn, stimulate another layer of the economy. Most induced activity accrues to retail, services, finance, insurance, and housing spending. Because employment is stimulated in these industries as well, *their* demands for inputs increase, yielding an additional round or additional rounds of indirect purchases and additional rounds of induced activity.

**ISRI** – Institute of Scrap Recycling Industries.

**Jobs** – The number of paid full- and part-time positions (counted at equal weight), not the number of full time equivalents.

**Multiplier or Multiplier Effect** – A term used when referring to economic effects or economic impacts. There are different kinds of multipliers -- this study reports two types. The *Type I* multiplier identifies the value of direct and indirect transactions -- e.g., the output of a business category and all other output that it purchases from its suppliers in the region -- relative to the value of only the direct transactions. The *Type II* multiplier identifies the value of all economic transactions (direct, indirect, and induced) that are stimulated in the economy by an industry under study, including the personal spending of employees throughout the supply chain whose economic activity is apportioned to the industry, relative to the value of only the direct transactions.

**NAICS** – North American Industrial Classification System, a new system introduced by the U.S. Department of Commerce, Bureau of the Census, in 1997 to classify businesses by their primary industrial activity. It replaces the SIC system and is compatible with systems used in Canada and Mexico.

**NERC** – Northeast Recycling Council.

**Own-Source** – Means revenues collected through the state revenue system and not received, for example, as a state disbursement of funds collected through the federal revenue system.

**Payroll** – Includes the wages and salaries of employees before taxes or other deductions are taken (includes paid vacation, bonuses, commissions, etc.). Does not include employer-paid benefits such as social insurance match, retirement, and medical benefits.

**Personal Income** – Includes the wages and salaries of employees and proprietors, normal profits to sole proprietors, and an estimate of the cash value of all benefits (e.g., social insurance, retirement, and medical benefits).

**Production Workers** – Workers (up through the line-supervisor level) engaged in fabricating, processing, assembling, inspecting, receiving, storing, handling, packing, warehousing, shipping (but not delivering), maintenance, repair, janitorial and guard services, product development, auxiliary production for plant's own use (e.g., power plant), record-keeping, and other services closely associated with these production operations at the

establishment covered by the report. Employees above the working-supervisor level are excluded from this item.

**Receipts** – Receipts (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts excludes all revenue collected for local, state, and federal taxes.

**REI** – Recycling Economic Information.

**SIC** – Standard Industrial Classification, a classification system used by the U.S. Census Bureau to identify businesses by their primary industrial activity.

**SPI** – Society of the Plastics Industry.

**SRI** – Steel Recycling Institute.

**SSEL** – Standard Statistical Establishment List, a database of economic data maintained by the U.S. Census Bureau.

**Total Economic Effects** – The sum of direct, indirect, and induced effects. They are all of the transactions attributable, either directly or indirectly, to the activities of establishments in the business categories included in this study.

**Total Industrial Output** – For most private industries this is simply gross sales. For public or quasi-public institutions this normally includes all public outlays, along with the value of government sales and other subsidies received, to isolate the current economic value of their output to the citizens or the area served.

**USGS** – U.S. Geological Survey.

**Value Added** – A measure of gross regional product. It includes all personal income (employment compensation, incomes to sole proprietors) plus property incomes (dividends, interests, and rents), and indirect tax payments (primarily excise and sales taxes paid by individuals to businesses).